Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Intelligent Transportation Systems Using	)	WT Docket No. 01-90
Dedicated Short Range Communications	)	

Ex Parte Comments of the Intelligent Transportation Society of America: Status Report and Recommendations for Licensing and Service Rules for the DSRC Spectrum in the 5850-5925 MHz Band

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SUMMARY

The Intelligent Transportation Society of America ("ITS America") hereby submits these *Ex Parte* Comments to update the Federal Communications Commission ("FCC" or "Commission") and to propose recommended licensing and service rules for the 5850-5925 MHz band ("5.9 GHz Band") allocated for Dedicated Short Range Communications ("DSRC") for intelligent transportation systems ("ITS") in Part 90 of the Commission's rules. DSRC systems use short range, wireless communications between vehicles traveling at highway speeds and between vehicles and roadside installations. This wireless link is expected to enable multiple public safety and private DSRC services that will improve traveler safety, increase highway and transit efficiency, decrease traffic congestion and reduce air pollution.

Recognizing the significant safety, efficiency and other public benefits associated with DSRC systems, the Commission allocated in October 1999 75 MHz in the 5.9 GHz for these services. The Commission did not specify licensing and service rules for the band, deferring them to a future proceeding. Since the allocation, ITS America, the US Department of Transportation ("USDOT"), the American Society for Testing and Materials ("ASTM"), private industry and others have contributed much time and resources, many as unpaid volunteers, to develop consensus-based recommended licensing and technical rules for use of the 5.9 GHz for DSRC services. These *Ex Parte* Comments set forth these proposed rules for the band.

The centerpiece of the Federal ITS program, created by Congress in 1991 and reauthorized in 1998, is the goal of achieving nationwide interoperability of ITS, including DSRC, systems and services throughout the country. In this way private and

commercial travelers will not be forced to use multiple stand-alone, proprietary systems and devices to pay tolls, receive real-time traffic updates or clear through borders. Achieving interoperability will make it possible for travelers to "seamlessly" access ITS services and applications as they move throughout the country. Moreover, nationwide interoperability should create larger markets, reduce development and manufacturing costs, and make ITS devices less costly to the end user. All of these factors will therefore spur deployment of ITS.

Likewise, the efforts of ITS America and its partners to enable use of the 5.9 GHz Band has centered on achieving interoperability within the band. This instant proposal, therefore, includes a recommendation that the Commission specify that all DSRC operations and equipment using the band conform to a single wireless data transmission standard: ASTM E2213-02, Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems – 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) ("ASTM E2213-02 DSRC Standard"). The ASTM E2213-02 DSRC Standard is based on a variant of the widely used Institute of Electrical and Electronic Engineers, Inc.'s ("IEEE") 802.11 and 802.11a wireless transmission standards using Orthogonal Frequency Division Multiplex ("OFDM") modulation. It was determined that using variants of these two IEEE standards should provide the higher data rata capabilities and reliability needed for DSRC operations. In addition, there already exists a large manufacturing base for 802.11 and 802.11a devices that could also provide DSRC equipment. ASTM E2213-02 DSRC Standard includes two layers. Layer 1, the "Physical" layer, refers to hardware specifications and modulations requirements used by

DSRC devices to access the 5.9 GHz Band frequencies. Layer 2, the "Medium Access Control" layer includes the instructions for how the Physical layer is to access the band frequencies. Additional layers of the standard are under development; however, because they do not implicate radio frequency issues, ITS America's request for compliance extends only to Layer 1 and Layer 2 of the standard.

In addition to compliance with the ASTM E2213-02 DSRC Standard, ITS America proposes a set of licensing and service rules that, it is believed, will enable the band to maximize benefits to the public. Applicants would be licensed on a site-by-site and first-come/first-served basis coordinated by existing public safety and private frequency coordinators. No licensing by auction or unlicensed DSRC operations would be conducted. Moreover, "On-Board Units," that is, DSRC devices on vehicles, would be licensed by rule to enable their installation as base equipment in millions of vehicles.

Based on the requirements of the ASTM E2213-02 DSRC Standard, ITS America further recommends a specific band channelization plan that includes the creation of seven (7) 10 MHz channels. One of these channels, at 5885-5895 MHz, would be designated as the "Control Channel", on which public safety and private would monitor for instructions, short messages and high priority public safety messages, such as emergency vehicle warnings. The remaining six (6) channels would be designated as "Service Channels," available for designated types of transmissions or transmissions too large to be sent on the Control Channel. Public safety and private users would share the Control and Service Channels. The proposed rules also include recommendations on transmitter power limits, antennas, emissions limits and other technical characteristics.

ITS America believes that compliance with the ASTM E2213-02 DSRC Standard, as well as the inclusion of the proposed licensing and service rules in Part 90, will result in the most rapid deployment and efficient use of the 5.9 GHz Band for DSRC and ensure nationwide interoperability as required by Congress. Accordingly, ITS America respectfully requests that the Commission consider these proposals in any rulemaking proceeding it may initiate.

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To: The Commission

***Ex Parte* Comments of the**
Intelligent Transportation Society of America:
Status Report and Recommendations for Licensing and Service Rules
for the DSRC Spectrum in the 5850-5925 MHz Band

Pursuant to Section 1.1206 of the Commission's rules, 47 C.F.R. § 1.1206, the Intelligent Transportation Society of America ("ITS America") respectfully submits these *Ex Parte* Comments: Status Report and Recommendations for Licensing and Service Rules for the DSRC Spectrum in the 5850-5925 MHz Band in WT Docket No. 01-90.

I. INTRODUCTION

The purpose of these *Ex Parte* Comments is to update and provide to the Commission a set of recommended licensing and service rules for it to consider in any *Notice of Proposed Rulemaking* for use of the 5850-5925 MHz Band ("5.9 GHz Band") Dedicated Short Range Communications ("DSRC"). In particular, ITS America recommends that the Commission specify that all DSRC-related applications operating in the band do so in compliance with ASTM E2213-02, Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems – 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control

(MAC) and Physical Layer (PHY) ("ASTM E2213-02 DSRC Standard"). A writing group convened under the auspices of the American Society for Testing and Materials International ("ASTM"), a nationally and internationally certified standards developing organization, has developed the standard. User compliance with this standard is intended to achieve interoperability in the band. These *Ex Parte* Comments were prepared in consultation with the ASTM writing group and represent a consensus view of those entities, public and private, seeking to enable the provision of DSRC services in the band.

II. BACKGROUND

A. Intelligent Transportation Systems and Dedicated Short Range Communications

Intelligent transportation systems ("ITS") apply new and emerging computing and communications technologies to surface transportation systems to make highways, transit systems, buses, rail, trucks, and passenger vehicles more efficient, less costly, cleaner and safer. ITS includes both public and private applications. On the public side, electronic toll systems employing millions of transponders deployed in vehicles so that they may pay tolls without stopping are already operating throughout the country. State and local transportation agencies use ITS to synchronize traffic lights, prioritize signals for emergency vehicles and buses, respond to and clear traffic accidents more quickly and provide real-time bus schedules to waiting passengers. Vehicle manufacturers such as General Motors and DaimlerChrysler use ITS to provide drivers of their vehicles with "telematics" services encompassing turn-by-turn directions, vehicle diagnostics and emergency assistance, among other services. The public and private sectors are also working together to collect and disseminate real-time traffic and traveler information

through closed-circuit television, radio, Internet, in-vehicle navigation devices, PDAs, and by dialing "511" from any landline or wireless phone.

All of these applications employ a communications link that enables the information, whether it be real-time traffic conditions or encrypted financial data, to move seamlessly between, for example, a transponder mounted on a car's windshield to a tollbooth, or from a roadside transmitter to an in-vehicle navigation device, or vice versa. Because transportation means mobility, a wireless radio link is the critical common element to effectuating these communications. Termed dedicated short-range communications ("DSRC"), this essential wireless link will be used for many differing ITS applications. (Other ITS applications, such as telematics and fixed roadside signage, use other wireless and fixed communications technologies, analog cellular and fiber optic, respectively, for which DSRC is not well suited. These *Ex Parte* Comments do not address the efficacy of these communications technologies for other ITS applications.) DSRC will transmit data messages across short distances from vehicles to and from roadside units and between vehicles while traveling at highway speeds. DSRC messages will be used, for example, to pay for tolls, parking and fuel; disseminate road construction and emergency warnings to vehicles; avoid collisions between vehicles; and transfer data on vehicle diagnostics and repairs. Moreover, DSRC communications can enhance security efforts through positive identification of vehicles, authorized and unauthorized. Existing wireless systems, such as cellular and PCS, do not provide sufficient access time and data transfer rates for DSRC messages, and their broad, geographic coverage areas are inappropriate for DSRC's limited range, site (and car) specific, real-time data transmissions.

B. Statutory Mandates for Federal ITS Program

Beginning in 1991, Congress established a national program within the U.S. Department of Transportation ("USDOT") to develop and deploy ITS (then called "Intelligent Vehicle Highway Systems") in the United States. Created in the Intermodal Surface Transportation Efficiency Act of 1991 ("ISTEA"),[1] Congress funded the national ITS program at a sum of nearly $2 billion over the six years of ISTEA. Congress also mandated in ISTEA that USDOT create a "National ITS Program Plan" and "National ITS Architecture" to spur the development and deployment of ITS systems that would be integrated and interoperable nationwide. The development of a National ITS Architecture identified a need for dedicated spectrum for reliable, short-range communications between vehicles traveling at highway speeds and roadside systems, or DSRC.

Congress passed ISTEA's successor legislation in 1998, which included continued funding for the national ITS program managed by USDOT. From 1998 until 2003, the Transportation Equity Act for the 21st Century ("TEA 21")[2] provides nearly $2 billion in additional federal funding for ITS. Funding is available for the maintenance and update of the National ITS Program Plan, continued development of the National ITS Architecture and supporting technical standards and protocols, research and development of vehicle and infrastructure technologies, and project deployment incentives in

[1] Pub. L. No. 102-240, 105 Stat. 1914 (1991) ("ISTEA")

[2] Pub. L. No. 105-178, 112 Stat. 107 (1998) ("TEA 21").

metropolitan and rural areas. In re-authorizing the federal ITS program in TEA 21, Congress concluded that:

> (1) investments authorized by the Intermodal Surface Transportation Efficiency Act of 1991 (105 Stat. 1914 et seq.) have demonstrated that intelligent transportation systems can mitigate surface transportation problems in a cost-effective manner; and [that]
>
> (2) continued investment in architecture and standards development, research, and systems integration is needed to accelerate the rate at which intelligent transportation systems are incorporated into the national surface transportation network, thereby improving transportation safety and efficiency and reducing costs and negative impacts on communities and the environment.[3]

In support of these goals, TEA 21 mandates that USDOT "develop, implement, and maintain a national architecture and supporting standards and protocols to promote the widespread use … of intelligent transportation system technology as a component of the surface transportation systems of the United States."[4] The National ITS Architecture and supporting standards and protocols must, to the maximum extent practicable, "promote interoperability among and efficiency of, intelligent transportation system technologies implemented throughout the United States."[5] USDOT is further charged with using standards-setting organizations to identify and develop critical ITS standards necessary to ensure the interoperability and efficiency of ITS systems throughout the country.[6] In accordance with this program, USDOT submitted a report to Congress in June 1999 identifying those standards critical to ensure national interoperability or critical to the

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[3] *Id.* at § 5202.

[4] *Id.* at § 5206(a)(1).

[5] *Id.* at § 5206(a)(2).

[6] *Id.* § 5206(a)(3).

development of other standards.[7] This report identified four critical standards related to DSRC applications then in development.[8]

TEA 21 also requires that all federal transportation funding used to deploy ITS projects must conform to the National ITS Architecture and applicable standards and protocols.[9] This "mainstreaming" of ITS funding based on a common and consistent technical framework is intended to achieve ITS deployments that are interoperable between and among each other. Achieving interoperability will enable the "seamless" use of ITS systems by the public as they travel from state-to-state, city-to-city – and from device-to-device. TEA 21 further requires that the Commission "consider, in consultation with [USDOT], spectrum needs for the operation of intelligent transportation systems, including spectrum for the dedicated short-range vehicle-to-wayside standard."[10] The FCC was also directed to complete a rulemaking considering the allocation of spectrum for ITS not later than January 1, 2000.[11]

C. National ITS Program Plan and National ITS Architecture

In the first years of the federal ITS program in the early 1990s, ITS America and USDOT collaborated on a National ITS Program Plan to guide the development and

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[7] *Id.* at § 5206(b).

[8] U.S. Department of Transportation: Intelligent Transportation Systems: Critical Standards (June 1999) (available at http://www.its-standards.net/).

[9] TEA 21 at § 5206(e)(1).

[10] *Id.* at § 5206(f).

[11] *Id.*

deployment of ITS applications in the United States. The National ITS Program Plan sets forth a common, national vision for ITS deployment. Ultimately, based on this common vision, the National ITS Program Plan seeks to define the types of specific applications and services, and the resulting benefits, for end users. (End users range from the traveling public to different organizations – public and private – that may act as ITS system operators.) The National ITS Program Plan is broken down into several layers from the general to the specific. The first layer consists of eight so-called "ITS User Service Bundles": Travel and Traffic Management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle Safety Systems, Information Management, and Maintenance and Construction Operations. The ITS User Service Bundles are broad categories of ITS applications and services organized by common purpose, types of end users, and/or technical characteristics. The next layer consists of 32 specific "ITS User Services," which document what ITS systems should do from the end user's perspective, organized across the eight User Service Bundles. This increasingly granular structure to the National ITS Program Plan is purposeful. Specific ITS applications and services do not exist in isolation: each is part of larger sub-systems and still larger systems that must interface with one another. A common, national deployment structure will ensure that all ITS applications and services are interoperable for maximizing safety and efficiency.

The identification in the National ITS Program Plan of the ITS systems, sub-systems and specific applications and services, and their technical requirements, together form the basis of a National ITS Architecture. The National ITS Architecture defines the physical, logical and institutional interface requirements between those applications and

services, sub-systems and systems.[12] It further defines the components of a given ITS project, its key functions, the organizations involved, and the type of information and means (*e.g.*, technical standards and protocols) of exchange between all participants and users of the information. DSRC services are identified in the National ITS Architecture as the communications link between vehicles and the roadside as well as between two or more vehicles.[13] As noted above, sponsors of ITS projects in the United States must use federal ITS funding only in a manner that conforms to the requirements of the National ITS Architecture. This conformance requirement was included in TEA 21 by Congress to promote interoperability between and among ITS projects. Accordingly, federally funded ITS deployments using the 5.9 GHz Band must only do so in conformance with the National ITS Architecture.[14]

In January 2002, USDOT and ITS America released a successor to 1995's National ITS Program Plan, entitled the "National Intelligent Transportation Systems Program Plan: A Ten-Year Vision."[15] This successor plan is not a replacement, but an attempt to map out the "second stage" of ITS development and deployment in the United States based on the earlier. The federal program structure encompassed by the ITS User

[12] Additional information about the National ITS Architecture can be accessed through a website maintained by USDOT at http://www.its.dot.gov/arch/arch.htm.

[13] A chart illustrating the DSRC interfaces in the National ITS Architecture is attached as Appendix A.

[14] Further information regarding the National ITS Architecture conformance requirements may be found at http://www.its.dot.gov/aconform/aconform.htm.

[15] Additional information about the 2002 plan and access to copies is available on ITS America's website, www.itsa.org.

Services and National ITS Architecture is to be maintained, as they remain as the program's foundation. Accordingly, the role of the 5.9 GHz Band as the essential wireless link for many ITS applications remains a vital element in the 2002 vision for ITS in the United States.

D. FCC's Allocation of 5850-5925 MHz for DSRC

In May 1997, ITS America petitioned the Commission for a rulemaking to allocate the 5850-5925 MHz band ("5.9 GHz Band") on a co-primary basis for DSRC-based ITS services.[16] The Commission released a *Notice of Proposed Rulemaking* in response in June 1998.[17] In October 1999, the Commission allocated 75 MHz at 5850-5925 MHz for private land mobile radio services under Part 90 of the Commission's rules[18] for use by DSRC-based ITS services.[19]

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[16] *Pleading Cycle Established for Comments and Reply Comments on Petition for Rulemaking Filed by the Intelligent Transportation Society of America*, RM-9096, Public Notice, DA 97-1106 (rel. May 28, 1997). In the United States, the other co-primary services in the band are Government Radiolocation Service (for use by high-powered military radar systems) and non-Government FSS uplink operations. ISM devices and unlicensed Part 15 devices are also permitted to operate in the 5850-5875 MHz band segment. The Amateur radio service has a secondary domestic allocation in the entire 75 MHz of the 5.9 GHz Band.

[17] *In the Matter of Amendment of Parts 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services*, ET Docket No. 98-95, Notice of Proposed Rulemaking, 13 FCC Rcd 14321 (1998).

[18] 47 C.F.R. Part 90.

[19] *In the Matter of Amendment of Parts 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services*, ET Docket No. 98-95, Report & Order, 14 FCC Rcd 18221 (1999) ("*Report & Order*").

In acknowledgement of its mandate under TEA 21 to consider the spectrum needs for DSRC-based ITS services, the Commission found that "the record in this proceeding overwhelming supports the allocation of spectrum for DSRC-based ITS applications to increase traveler safety, reduce fuel consumption and pollution, and continue to advance the nation's economy."[20] The Commission recognized the critical importance of communications as the essential "backbone" for all ITS applications.[21] It also noted the TEA 21 requirement to deploy ITS systems that are interoperable.[22]

Further, the Commission concluded that the 5.9 GHz Band is the "best available choice" for DSRC applications.[23] The band is potentially compatible with European and Asian DSRC efforts, and the allocation should therefore produce economies of scale, reduce costs and promote international compatibility.[24] The available radio technology, signal propagation characteristics and available spectrum capacity in the 5.9 GHz band are well suited to the short range communications that characterize DSRC-based ITS services.[25] Accordingly, the Commission allocated the 5.9 GHz Band on a primary basis to the mobile service for use by DSRC-based ITS operations.[26]

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[20] *Id.* at 18223.

[21] *Id.* at 18222.

[22] *Id.* at 18230.

[23] *Id.* at 18224.

[24] *Id.*

[25] *Id.*

[26] *Id.* at 18227.

The Commission added the following definition of DSRC services in Part 90 of its rules:

> The use of non-voice radio techniques to transfer data over short distances between roadside and mobile radio units, between mobile units, and between portable and mobile units to perform operations related to the improvement of traffic flow, traffic safety and other intelligent transportation applications in a variety of public and commercial environments. DSRC systems may also transmit status and instructional messages related to the units involved.[27]

The Commission also added rules to Subpart M (Intelligent Transportation Radio Service) of Part 90 pertaining to technical parameters (*i.e.*, power, emission limits, and RF safety guidelines), general service scope and protection from Government Radio Location services[28] for promoting spectrum sharing and creating a basic framework for the development of DSRC operational standards by industry, but further recognized that these rules would likely be changed pending a future proceeding to develop specific licensing and service rules for DSRC systems.[29]

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[27] *Id.* at 18236 (codified at 47 C.F.R. §§ 90.7 and 90.371). The Commission also added a footnote to its Table of Frequency Allocations to ensure mobile operations in the 5.9 GHz Band are ITS related. *Report & Order* at 18227. Footnote NG160 now reads: "In the 5850-5925 MHz band, the use of non-Federal government mobile service is limited to Dedicated Short Range Communications Operating in the Intelligent Transportation System radio service." 47 C.F.R. § 2.106 NG160.

[28] *Id.* at §§ 90.205(m), 90.210, 90.350, 90.371. *See* 64 Fed. Reg. 66405 (Nov. 26, 1999).

[29] *Report & Order* at 18230. In its petition, ITS America did not propose a specific channelization plan, licensing method or technical rules, suggesting instead that these issues are best developed by industry consensus through standardization activities and further Commission proceedings. The status of these standardization activities is discussed below.

Two entities, Mark IV Industries, Ltd. and PanAmSat Corporation filed separate petitions[30] seeking reconsideration or clarification of certain issues in the *Report & Order*. The Commission has yet to address these petitions, but ITS America believes that their resolution should not hinder the Commission's consideration of proposed licensing and services rules for the band.

E. ASTM DSRC Standards Writing Group

In accordance with the interoperability mandate stated in TEA 21, USDOT has supported with funding and staff resources several standards-setting efforts to identify and develop critical standards and protocols for ITS systems and applications. These efforts are being conducted in partnership with several national and international standards setting organizations, while ITS America chairs a council of such standards organizations. One such effort is to develop a wireless data transmission standard for the 5.9 GHz Band. Starting in June 1999, a writing group has been meeting monthly under the auspices of the ASTM Working Group E17.51 ("Standards Writing Group"). Participating members of the Standards Writing Group volunteer their time and represent a broad group of public, private and international stakeholders.[31]

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[30] *In the Matter of Amendment of Parts 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services*, ET Docket No. 98-95, RM-9096, Petition for Clarification of Mark IV Industries Ltd., I.V.H.S. (submitted Dec. 27, 1999); *In the Matter of Amendment of Parts 2 and 90 of the Commission's Rules to Allocate the 5.850-5.925 GHz Band to the Mobile Service for Dedicated Short Range Communications of Intelligent Transportation Services*, ET Docket No. 98-95, RM-9096, Petition for Reconsideration or Clarification of PanAmSat Corporation (filed Dec. 27, 1999).

[31] Members of the Standards Writing Group are listed in Appendix B.

As a unit of ASTM, the group operates as a consensus-based organization. In accordance with the operating principles of the American National Standards Institute ("ANSI"), of which ASTM is a participating member, the proceedings of the ASTM Standards Writing Group are open, inclusive of all interested participants, characterized by due process and decisions reached only through consensus, cooperation and compromise.

The selection of a single, open and national standard for DSRC public safety applications has been the highest priority of the Standards Writing Group. The group initially considered three candidate standards, which was then reduced to two. In fall 2001, after conducting tests and evaluations of the remaining two candidate standards, the group "down selected" to a single standard: a version of Institute of Electrical and Electronic Engineers, Inc.'s ("IEEE") 802.11 and 802.11a wireless transmission standards using Orthogonal Frequency Division Multiplex ("OFDM") modulation. The Standards Writing Group concluded that this approach would best meet the identified user requirements as well as provide a competitive supply of equipment at low cost resulting from a high volume of units and multiple sources of supply. As further described below, the standard was successfully balloted on May 10, 2002 by the ASTM Subcommittee E17.51 Vehicle Roadside Communication, under which the Standards Writing Group operates. Official publication by ASTM is expected in late summer 2002.[32]

[32] The May 10, 2002 balloted ASTM E2213-02 DSRC Standard will undergo validation and verification testing as well as further review, which may result in a modified version after the date of this filing and during any rulemaking proceeding initiated thereafter by

ASTM approval of the standard will not end the work of the Standards Writing Group. The overall band architecture, upper layer protocols and related issues remain to be determined. Accordingly, at the end of 2001 the Standards Writing Group organized itself into eight task forces: Architecture, Security, Lower Layers, Upper Layers, Layer Management, Vehicle-to-Vehicle Communications, Early Adopter Applications and Industry Consortium. These task forces are already studying the potential application of the ASTM E2213-02 DSRC Standard and other candidate protocols to these other elements of the 5.9 GHz Band.

F. ASTM E2213-02 DSRC Standard

The ASTM E2213-02 DSRC Standard[33] has been developed specifically for the purpose of providing short range, very high-speed communications in a point-to-point or point-to-multipoint configuration. The standard describes a system intended for the rapid and reliable transmission of data between and across networks consisting of stopped, slow, or fast moving vehicles (passenger, commercial, emergency and maintenance) and between the roadside and these vehicles.

The standard describes the methodology and minimum requirements for universally connecting a mobile or fixed device to the "DSRC network." The standard

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the Commission. It is ITS America's understanding that ASTM will provide the Commission with the final version of the standard for its consideration.

[33] ASTM holds the copyright to the standard. ITS America understands that ASTM will submit the standard document to the Commission under separate cover shortly after the filing of these *Ex Parte* Comments. Moreover, ASTM is expected to request that a copy of the standard be made available for review at the Commission's Reference Library rather than posted on the Commission's website or available from the Commission's authorized copier.

details the connection requirements in two “Layers”, a term developed for the “Open Systems Interconnection” model for network connectivity and used to describe a grouping of components or specifications that must be present to connect a client or host device to a network. Layer 1, the “Physical Layer” (“PHY Layer”), refers to the hardware specification and modulation requirements used by the On-Board Units and Roadside Units to access the band frequencies. Layer 2, the “Medium Access Control Layer” (“MAC Layer”), defines the elements necessary to tell the PHY Layer how to access the band frequencies and containing the intelligence to control the transaction. The two layers form the common framework for universal connectivity to the DSRC wireless network. Also provided in the standard are a band channelization plan, power limits, emissions mask, data timing and transfer characteristics, and a prioritization of services.

Included characteristics found in the ASTM E2213-02 DSRC Standard for the PHY and MAC Layers are:

- ODFM modulation;
- Data rates;
- Transmit and receive vector specifications;
- Receive RSSI parameters for relative power measurement;
- Timing related parameters and synchronization;
- OFDM training structure;
- Regulatory requirements list;
- Channel numbering, channelization, and channel plan;
- Transmit and receive antenna requirements, impedance and polarization;
- Operating temperature ranges for compliance with OFDM PHY Layer;
- Device classes and transmission power limits;
- DSRC spectral mask;
- Receiver performance specifications;
- OFDM PHY Layer management information base attributes; and
- Other tables detailing requirements for other modulation or receiver characteristics.

The standard is an extension of two globally accepted standards for wireless networking: IEEE 802.11 (MAC) and IEEE 802.11a (PHY). The MAC Layer specification is the same as prescribed in IEEE 802.11; the PHY Layer of IEEE 802.11a has been modified in this instance to permit operation in a high-speed mobile environment in the 5.9 GHz Band. Compliance with the PHY Layer and MAC Layer should result in a wide-scale, open architecture and interoperability between DSRC devices. The decision to apply variants of IEEE 802.11 (MAC) and IEEE 802.11a (PHY) to the 5.9 GHz Band resulted from a determination that these standards will provide higher data rate capabilities than otherwise available under other considered standards. There is a larger existing manufacturing base for 802.11 and 802.11a devices that could also provide DSRC equipment.[34]

Additional layers beyond Layer 1 and Layer 2 are currently under development within the Standards Writing Group and other standards-setting organizations, such as IEEE. These subsequent layers will include a Layer Manager and an Application Layer, among others. As discussed below, the Commission is herein requested to specify compliance with only the ASTM E2213-02 DSRC Standard Layer 1 and Layer 2. These

[34] In particular, the Standards Writing Group took into account of the fact that the 5.9 GHz Band is adjacent to the unlicensed UNII band at 5735–5815 MHz. Many of the wireless LAN applications operating in the UNII band use the IEEE 802.11a wireless transmission standard. There was consensus in the Standards Writing Group that adopting an 802.11a variant for the 5.9 GHz Band should make it possible for UNII band equipment manufacturers also to manufacture DSRC devices using, for example, a common, base chipset. Moreover, the Standards Writing Group anticipates that, by using a common transmission standard, it may be possible for a single device to operate in both bands.

layers are the only two that implicate radio frequency issues of concern to the Commission. Accordingly, this request does not reach additional layers.

G. International Band Harmonization and Standards Development

Before and subsequent to the allocation of the 5.9 GHz Band for DSRC in 1999, complementary efforts have been undertaken to harmonize the U.S. allocation with spectrum in Canada, Europe and Japan.

Canada: The federal government ministry Industry Canada is in the process of allocating the 5855-5925 MHz band for DSRC applications. A nationwide Canadian standard, entitled "Spectrum Management, Radio Standard Specification, Location and Monitoring Service is expected to be adopted and would include the same channelization plan as specified in the ASTM E2213-02 DSRC Standard.[35] DSRC operations in Canada would also need to comply with the adopted Canadian standard.

Europe: In 1996, the Comité de Normalisation ("CEN") approved the 5.795-5.805 GHz band for DSRC applications in Europe. It was announced in 1997 that additional spectrum in the 5.805-5.815 might also be allocated for DSRC. In addition, CEN has developed a set of DSRC standards, including for the Physical Layer (L1), Data Link Layer (L2) and Application Layer (L7).

Japan/Singapore/Korea: In 1997, Japan, Singapore and South Korea made available the 5.8 GHz ISM band for DSRC systems. Subsequent allocations in Japan have now made available the 5.77 to 5.85 GHz band for DSRC applications. Japan has

[35] The DSRC licensing and service rules proposed herein have been harmonized with these companion efforts in Canada. Similar discussions with Mexico are being sought.

also developed national DSRC standards designated ARIB T-55 and a new generation designated ARIB T-75.

ITU: The issue of a worldwide spectrum allocation for DSRC services is also being considered by the International Telecommunications Union ("ITU"). Most recently, in May 2002, Canada asked that the ITU consider the 5.9 GHz Band as a candidate band for designation for the delivery of global "Public Protection and Disaster Relief", the ITU designation for public safety services. An ITU working group is currently assessing the merits of this proposal and is expected to submit its findings for possible inclusion on the agenda for the World Radiocommunication Conference in 2003 in Venezuela.

ISO: International harmonization efforts are also occurring within the International Standards Organization ("ISO"). For example, a proposal has been made within ISO's TC 204 Working Group 16.1 Communications Medium and Long Range ("CALM") Committee to adopt the ASTM E2213-02 DSRC Standard as the 5 GHz radio standard internationally.

H. ITS America

Established in 1991, ITS America is a nonprofit, educational and scientific association created to promote the development and deployment of ITS systems to improve the safety and efficiency of the nation's surface transportation infrastructure to enhance efficiency, reduce costs and improve the safety of the traveling public. ITS America serves as a utilized Federal Advisory Committee to the USDOT under the

Federal Advisory Committee Act.[36] Its members represent a broad spectrum of entities and individuals with interest in ITS drawn from private industry, federal, state and local governments and the academic community. ITS America can count among its more than 600 members major US companies, including Fortune 500 companies, international corporations, and small and new companies involved in the manufacturing, research and development, consulting and transportation of goods and services. All 50 state departments of transportation are members, in addition to local transportation agencies, toll authorities and other governmental bodies responsible for providing transportation and other vital services to the US public. Moreover, major US universities and transportation research institutions also participate.

ITS America has appeared before the Commission in multiple proceedings apart from its efforts pertaining to the 5.9 GHz Band. For example, the organization, along with the U.S. Department of Transportation and Mitretek Systems, a non-profit scientific engineering and research organization, played a role in obtaining the Commission's allocation of "511" in July 2000 as the nationwide, abbreviated dialing code for accessing traveler information services. ITS America continues to lead efforts in the deployment of these services in conjunction with USDOT and the American Association of State Highway & Transportation Officials. In 1995, at ITS America's urging, the Commission created the "Intelligent Transportation Systems Radio Service" as Subpart M in Part 90 of its rules.[37] ITS America remains interested in other proceedings, technologies and

[36] 5 U.S.C. Appendix.

[37] 47 C.F.R. Subpart M. *See* 60 Fed. Reg. 15253 (Mar. 23, 1995).

spectrum allocations, including: ultra wideband technology authorization, the use of the 76-77 GHz band for vehicle collision avoidance radar systems, telematics systems using the AMPS standard for automatic collision notification, and wireless 3G services. All of these activities speak to the critical function played by a variety of communications technologies in the deployment of ITS-related applications.

In October 2000, ITS America submitted to the Commission a status report ("*Status Report*") regarding progress since the *Report & Order* in October 1999 to build consensus among ITS stakeholders on the most effective licensing and service rules.[38] While it did not make specific recommendations, the *Status Report* noted that there was clear stakeholder consensus that public safety applications in the 5.9 GHz Band should be accorded the highest priority in any licensing and service rules.[39] ITS America further noted that the possible band channelization approaches had been narrowed to three possibilities, in no particular order: (1) allocation of the 5.9 GHz Band for public safety usage; (2) division of the spectrum band between public safety and private uses licensed on a site-by-site basis; and (3) division of the spectrum between public safety and commercial usage licensed by geographic area.[40] The *Status Report* went on to discuss possible licensing options, service definition and licensing requirements, and technical

[38] *In the Matter of Service Rules for the 5.850-5.925 GHz Band, and Revisions to Part 90 of the Commission's Rules*, Intelligent Transportation Society of America: Status Report of the On Licensing and Service Issues and Deployment Strategies for DSRC-Based Intelligent Transportation Services in the 5.850-5.925 GHz Band (submitted October 12, 2000) ("*Status Report*").

[39] *Id.* at 18.

[40] *Id.* at 19-22.

issues such as power limits, emission masking, frequency stability and spectrum sharing, interference and frequency coordination.

In response to the filing, the Commission opened the instant proceeding, WT Docket No. 01-90, and solicited public comments regarding the Status Report. In addition to ITS America, the Commission received Comments and Reply Comments from six organizations.[41] While several of these comments raised individual concerns about the implementation and use of the 5.9 GHz Band, the record unanimously supported the adoption of a *Notice of Proposed Rulemaking* for licensing and service rules for the spectrum by public safety and private users.[42]

Since the filing of the *Status Report* and the round of comments to the Commission thereto, ITS America has continued to facilitate the workings of the Standards Writing Group as described above. ITS America has also sought to inform key FCC staff members of the Standards Writing Group's efforts to draft and adopt the relevant standards and establish proposed licensing and service rules for consideration by the Commission. Within the past year, representatives from ITS America and the

[41] Comments and/or Reply Comments were received from Federal Signal Corporation; Warren G. Havens and Telesaurus Holdings GB, LLC; Mark IV Industries, Ltd.; Motorola; Public Safety Wireless Network Program; and TransCore Corp.

[42] Further, ITS America noted in its comments that the 5.9 GHz Band is not well suited to Commercial Mobile Wireless Services ("CMRS"), which are inconsistent with the spectrum's overriding public safety purpose. ITS America Comments at 5-6. Accordingly, ITS America recommends that the definition of DSRC services that appears in Section 90.7 of the Commission's rules, 47 C.F.R. § 90.7, and related provisions of Subpart M, should be changed to indicate clearly that CMRS services are not eligible for the DSRC spectrum by replacing "commercial" with "private" environments to refer only to private radio DSRC uses. *See* Section III.C., *infra*.

Standards Writing Group have met with FCC staff numerous times and, most recently, on June 19, 2002.

I. Purpose of this Filing and Requested Next Steps

Based on the consensus viewpoint of public and private members of the Standards Writing Group and other stakeholders in the ITS community, these *Ex Parte* Comments set forth ITS America's specific recommendations regarding proposed licensing and service rules for the 5.9 GHz Band allocated for DSRC services.[43] The purpose of these proposed rules is fourfold: (1) achieve nationwide interoperability of DSRC systems, devices and applications; (2) promote the increased use of these devices and applications by the traveling public; (3) foster the growth of competitive markets in the United States and abroad for US equipment and service providers; and (4) ensure that the 5.9 GHz Band is used as efficiently as possible. Key to achieving these four goals is the further recommendation that all DSRC services in the band be conducted in compliance with the ASTM E2213-02 DSRC Standard. The Commission is therefore asked to consider these proposed licensing and service rules in its preparation of any *Notice of Proposed Rulemaking* to establish the most appropriate licensing and service rules for the band.

III. DSRC APPLICATIONS, DEVICES AND COMMUNICATIONS

The proposed licensing and services rules described herein seek to establish a band architecture and operations consistent with the Commission's *Report & Order*. Any licensing and service rules adopted by the Commission should further satisfy the requirements assigned to the 5.9 GHz Band in the National ITS Program Plan and

[43] The proposed licensing and service rules appear as Appendix C.

National ITS Architecture. This section provides an overview of the likely DSRC applications, devices and communications that the proposed ASTM E2213-02 DSRC Standard is intended to enable.

A. DSRC Applications

Consistent with the National ITS Architecture, the *Report & Order* allocates the 5.9 GHz Band for mobile services on a primary basis for short range data transmissions from roadside-to-vehicle and from vehicle-to-vehicle.[44] The band may be used for many differing ITS applications, users and types of information: "improving traffic flow, traffic safety and other intelligent service applications in a wide variety of public and commercial environments … status and instructional messages related to the units involved."[45] While this definition is broad, enabling use of the band by both public safety and private users, the band is not intended to support all ITS applications. (Other ITS applications will continue to use differing communications technologies, such as analog cellular for wide area coverage, more appropriate to their operating requirements.) DSRC applications are crosscutting, represented in all eight ITS User Service Bundles: Travel and Traffic Information (vehicle-to-roadside communications); Advanced Vehicle Safety Systems (vehicle-to-vehicle communications); Electronic Payment (vehicle-to-roadside communications); Commercial Vehicle Management (vehicle-to-roadside);

[44] *Report & Order* at 18227. The 5.9 GHz Band may also be used for vehicle-to-handheld or portable communications. *See* 47 C.F.R. § 90.7 (definition of Dedicated Short Range Communications Services adopted in *Report & Order*).

[45] *Report & Order* at 18236. As discussed below in V.B., there is consensus in the ITS community that the term "commercial environments" in this definition should be replaced with "private environments."

Public Transportation Management (vehicle-to-roadside and vehicle-to-vehicle communications); Emergency Management (vehicle-to-roadside and vehicle-to-vehicle communications); Information Management (vehicle-to-roadside and vehicle-to-vehicle communications); and Maintenance and Construction Operations (vehicle-to-roadside communications). As expected use of the band increases in the future, new and unforeseen applications will be deployed consistent with the ITS User Service Bundles.

The proposed licensing and service rules described herein address the availability of the 5.9 GHz Band for both types of users. In their several briefings before FCC staff, ITS America and the Standards Writing Group identified a group of public safety and private applications for which there is consensus support. A current version of this list of public safety and private applications is reproduced below. The associated ITS User Service Bundles are also identified for each application. While this list represents specific DSRC applications available today using current technologies, it should not be viewed as static. It is expected that new and currently unforeseen DSRC applications will be developed for the band. So long as these as yet unknown applications meet the eligibility requirements to be defined in Part 90 of the Commission's rules, their use should also be authorized.

PUBLIC SAFETY APPLICATION	**ITS USER SERVICE BUNDLE**
• Probe Data Collection	• Travel and Traffic Management
• Traffic Information	• Travel and Traffic Management
• Toll Collection	• Electronic Payment
• Intersection Avoidance	• Advanced Vehicle Safety Systems
• In-Vehicle Signing, including: o Work Zone Warning o Highway/Rail Intersection Warning o Road Condition Warning	• Emergency Management, Advanced Vehicle Safety Systems, Maintenance and Construction Operations
• Vehicle-to Vehicle, including: o Vehicle Stopped or Slowing o Vehicle/Vehicle Collision Avoidance	• Advanced Vehicle Safety Systems

o Imminent Collision Warning	
• Rollover Warning	• Advanced Vehicle Safety Systems
• Low Bridge Warning	• Advanced Vehicle Safety Systems
• Main Screening	• Commercial Vehicle Operations, Information Management
• Border Clearance	• Commercial Vehicle Operations, Information Management
• On-Board Safety Data Transfer	• Emergency Management, Information Management
• Commercial Vehicle Operations (CVO) Driver's Daily Log	• Commercial Vehicle Operations
• Vehicle Safety Inspection	• Emergency Management, Information Management
• Transit Vehicle Data Transfer (gate and yard)	• Public Transit Management
• Transit Vehicle Signal Priority	• Public Transit Management
• Emergency Vehicle Video Relay	• Emergency Management
• Emergency Vehicle Approach Warning	• Emergency Management

PRIVATE APPLICATION	**ITS USER SERVICE BUNDLE**
• Access Control	• Information Management
• Gas Payment	• Electronic Payment
• Drive-Thru Payment	• Electronic Payment
• Parking Lot Payment	• Electronic Payment
• Data Transfer, including	• Information Management
o Advanced Traveler Information Systems (ATIS) Data	
o Vehicle Diagnostic Data	
o Repair Service Record	
o Vehicle Computer Program Updates	
o Map and Music Data Updates	
• Rental Car Processing	• Information Management, Electronic Payment
• Unique Commercial Vehicle Operations (CVO) Fleet Management	• Commercial Vehicle Operations, Information Management
• Commercial Vehicle Operations (CVO) Truck Stop Data Transfer	• Commercial Vehicle Operations, Information Management
• Locomotive Fuel Monitoring	• Information Management
• Locomotive Data Transfer	• Information Management

B. DSRC Devices

As described in the *Report & Order*, three types of receiver and transmitter units are authorized to operate in the 5.9 GHz Band: roadside units, mobile units and portable

units.[46] According to the ASTM E2213-02 DSRC Standard, the characteristics of the three devices authorized by the Commission would be encompassed in only two devices: Roadside Units and On-Board Units. A Roadside Unit would be a fixed transceiver constructed, for example, alongside or over a highway or secondary road, at an intersection or in a parking lot. While a Roadside Unit may be mounted on a vehicle or hand carried, it could only operate when stationary. An On-Board Unit could be mobile or portable as contemplated by the Commission. It may be mounted in or on a vehicle (*i.e.*, mobile) and may also be hand carried (*i.e.*, portable). In contrast to a Roadside Unit, it would operate whether moving or stationary. Compliance with the ASTM E2213-02 DSRC Standard would limit both devices for use only in support of eligible DSRC applications in the band.

C. DSRC Communications

The FCC's allocation order permits only data transmissions in the 5.9 GHz Band, which is consistent with the description of DSRC in the National ITS Architecture.[47] The Commission further concluded that permitting voice services would hinder the use of the band for DSRC data applications.[48] Other land mobile services are more suited to provide any needed voice communications for ITS applications.[49] It is expected,

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[46] *Report & Order* at 18236.

[47] *Id.*

[48] *Id.*

[49] *Id.* Moreover, the proposed channelization plan – consisting of a "Control" Channel and surrounding "Service" Channels – cannot technically support real-time, two-way short range mobile voice communications such as provided by cordless phones in homes.

however, that an On-Board Unit would be able to convert certain types of data transmissions to voice messages. For example, a transportation agency may want to transmit an advisory that drivers may encounter ice on an upcoming stretch of highway. Taking advantage of "store and forward" techniques,[50] On-Board Units receiving the data transmission would translate the signal into a voice message played back to the driver.[51] Consistent with the Commission's *Report & Order*, modulated voice communications should not be permitted. More generally, data transmissions, translated into voice by On-Board Units, could employ Voice-over-IP, VoiceXML, or another data packet radio technique. Such use, however, should not be construed as real-time, two-way voice traffic. To avoid any potential confusion, ITS America proposes that the word "non-voice" be dropped from the definition of DSRC appearing in Part 90. The proposed rules found in Appendix C include this change.

Successfully transmitting DSRC messages presents unique technical challenges. The majority of transmissions will occur between vehicles or between a moving vehicle and a fixed transmitter in a line-of-sight, point-to-point or point-to-multipoint configuration. In many instances, it is likely that a vehicle will be traveling at highway speeds[52] and will pass through a communications zone in very little time. In that brief

[50] *See, e.g.*, 47 C.F.R. § 90.353(c) (authorizing store and forward techniques in the Location and Monitoring Service band at 902-928 MHz for later transmission over the PSTN or to vehicles or objects being monitored.)

[51] This capability is termed "Interactive Voice Response," and may be more effective in conveying safety warning messages to drivers than lights or other, non-verbal sounds.

[52] Design requirements for electronic toll collection are based on vehicle speeds of up to 120 miles per hour.

moment the proper channel must be acquired and the transmission sent and received. It is estimated that the data rates must be at least 6 Mbit/s.[53] Reliability is critical as there may be little time for a transmission to be re-sent if an error occurs. Moreover, while many of the DSRC applications will involve distances of less than 15 meters between transmitter and receiver, other applications, such as work zone warnings and emergency traffic signal preemption, require a distance of up to 1000 meters. The transmission technology must therefore be able to accommodate a wide range of distances. Reliable operation is also a function of how many co-channel devices are operating in the same vicinity at the same time. At a busy intersection with multiple gas stations, or at an electronic tollbooth on a highway, it may be possible to have hundreds of vehicle-mounted transponders within the line-of sight and range of a single transmitter. The IEEE 802.11a wireless transmission standard has been selected in part by the Standards Writing Group to meet these unique operating challenges.

IV. INTEROPERABILITY AND STANDARDS COMPLIANCE

USDOT and ITS America are overseeing efforts to implement the Commission's allocation of the 5.9 GHz Band for DSRC services. The Standards Writing Group was created and instructed to advise USDOT and ITS America on how interoperability in the band may be achieved.[54] In response to this charge, the Standards Writing Group has

[53] On the Control Channel message preambles could transmit at 3 Mbit/s while the message itself must transmit at 6 Mbit/s.

[54] Definition of interoperability in Part 90: "An essential communication link within public safety and public service wireless communications systems which permits units from two or more different entities to interact with one another and to exchange information according to a prescribed method in order to achieve predictable results." 47 C.F.R. § 90.7.

developed the ASTM E2213-02 DSRC Standard as an open, non-proprietary wireless transmission standard for DSRC applications in the band. Adherence to this standard by all users – public safety and private – will make it possible for data to be seamlessly and reliably transmitted from vehicle-to-roadside, from vehicle-to-vehicle and from device-to-device. Interoperability among all DSRC radio devices – Roadside Units and On-Board Units – will guarantee compatibility and lead to the faster deployment of DSRC applications in both the United and States and elsewhere. Accordingly, the ITS community has reached consensus that any licensing and service rules for the band should specify compliance with Layer 1 and Layer 2 of the ASTM E2213-02 DSRC Standard.

A. Interoperability for DSRC

Where products and services, whether for communications or otherwise, are introduced to the public based on competing standards, it has taken years or even decades to gain market acceptance. Left behind are early adopters holding stranded infrastructure or unusable consumer products. The success of other communications systems, such as the Internet, confirm the conclusion that interoperability is critical to ensure that information can be disseminated to the largest number of users, whether closely located or separated by vast distances. Without adoption of a common standard for connection and information dissemination, today's Internet would be fragmented, disjointed and largely inoperable except within local area boundaries segmented by manufacturers' equipment. The use of a common standard does not preclude the use of proprietary

applications, but ensures that they can co-exist. In addition, the introduction of minimum standards should ensure that future applications are compatible to existing devices.

Already, the ITS community is confronting problems caused by non-interoperable systems and devices. For example, toll transponders already deployed on many highways, bridges and tunnels are incompatible with one another. Toll agencies or the hired system integrators have required the supplying vendors to create proprietary systems for individual toll systems.[55] Interstate vehicles, especially commercial vehicles, are therefore forced to carry multiple toll tags for commonly traveled routes or stop to pay at those toll booths for which it does not have a proprietary tag. For example, a long-haul commercial truck could encounter at least three incompatible toll systems traveling from California to Florida. In California it's Fastrak®. Texas uses Tolltag®. Florida has Sunpass®. If that same truck were then to travel to the Northeast, it would encounter EZ-Pass®. Moreover, using multiple and incompatible tags may cause spectrum use disruptions. For example, while all currently deployed tags operate in the 902-928 MHz non-multilateration sub band, the lack of a common transmission standard means that a tag for a different toll system may interfere with another when presented to a reader of the other system. Solving these and similar problems is not possible at the local or statewide level. National attention and resources must be applied. ITS America recommends, therefore, that the Commission specify compliance with ASTM E2213-02 DSRC Standard for ensuring interoperability.

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[55] Only California has attempted to require vendors to build toll equipment to a common standard. *See* Cal. Code Regs Title 21 §§ 1700 *et seq.* (1998) ("Compatibility Specifications for Automatic Vehicle Identification Equipment"). However, even within that state, different toll authorities often still do not recognize the tags of other authorities.

B. Commission Precedent for Standards Compliance

The Commission has been generally hesitant to specify compliance with a particular standard in its rules. In certain cases, however, the Commission has found that the public interest favors such an action. For example, the Commission has adopted specific standards pertaining to the transmission of digital broadcast signals and other elements of over-the-air broadcast television.[56] It has also adopted standards for the measurement of intentional and unintentional radiating unlicensed devices.[57] Moreover, the Commission required "performance" as opposed to "technical" or "prescriptive" standards for Enhanced 911 wireless location capabilities.[58] This list is not exhaustive.

The Commission's rationale for compliance with the digital television ("DTV") transmission standard is analogous to the 5.9 GHz Band. In 1996, the Commission determined that the public interest would be served by compliance with a proposed consensus standard for DTV transmission that had been developed and approved by its Advisory Committee on Advanced Television Service.[59] The Commission initially examined two general conditions for any decision requiring adherence to a standard.

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[56] *See, e.g.*, 47 C.F.R. § 73.682(d) (digital broadcast television transmission standards); § 73.682(a)(21)(iv) ("ghost canceling"); § 73.682(c)(3) and § 73.681 ("BTSC stereo sound"); § 15.119 and § 73.682(a)(22)(i) (closed captioning).

[57] *See id.* at § 15.31(a)(6).

[58] *See In the Matter of Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket No. 94-201, Report and Order and Further Notice of Proposed Rulemaking, 11 FCC Rcd 18676, 18712-13 (1996).

[59] *See In the Matter of Advanced Television Systems and Their Impact Upon the Existing Broadcast Service*, MM Docket No. 87-268, Fifth Further Notice of Proposed Rulemaking, 11 FCC Rcd 6235 (1996).

First, there needs to be a substantial public benefit from a standard. Because of the ubiquitous presence of television in American households, the Commission found that the first condition was clearly applicable.[60] Second, private industry is unwilling or unable to reach agreement on a single industry standard.[61] At least in the case of DTV, the Commission concluded that the second condition was not applicable because of strong and broad industry support for the proposed standard.[62] The Commission set forth four policy objectives for determining whether the application of a specific DTV transmission standard would be in the public interest:

1. to ensure that all affected parties have sufficient confidence and certainty in order to promote the smooth introduction of a free and universally available digital broadcast television service;
2. to increase the availability of new products and services to consumers through the introduction of digital broadcasting;
3. to ensure that the [FCC's] rules encourage technological innovation and competition; and
4. to minimize regulation and assure that any regulations [the FCC does] adopt remain in effect no longer than necessary.[63]

Requiring a standard may provide certainty to consumers, licensees and equipment manufacturers, especially where a new technology is coming to market. Moreover, consumers may be assured that investments in a given technology will not be rendered obsolete by a subsequent, different technology. A required standard also guarantees compatibility. Consumers can purchase a device knowing that it can be used

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[60] *Id.* at 6247.

[61] *Id.*

[62] *Id.*

[63] *Id.* at 6236.

in different applications. Compatibility also reduces the need to buy duplicative equipment or special devices to convert from one standard to another. Finally, the lack of standards may cause consumers and manufacturers to adopt a "wait-and-see" approach before purchasing or making devices, respectively, thus slowing down deployment. On the cost side, the Commission noted that requiring adherence to a standard could deter new technical innovations and improvements, thus effectively "locking in" a less optimal technology. Competition may also be reduced because product developers are not able to compete on the basis of different technologies.[64]

The Commission concluded that adherence to the proposed DTV transmission standard would satisfy its four objectives and, therefore, be in the public interest. First, the broadcast nature of television, which the public receives for at no cost over the air, argues in favor of a common DTV transmission standard that is also free and universally available. This would promote the smooth introduction of the technology. Second, by adopting the DTV transmission standard, the Commission would increase the availability of new products and services to consumers because the standard is flexible and extensive. Third, the standard will encourage technological innovation and competition (although the Commission noted that the proposed standard did not include requirements for video formatting.) Fourth, and last, the particular standard is the minimum of regulation needed

[64] *Id.* at 6248. However, other forms of competition – price, service and product features – may be enhanced where a standard is prescribed. *Id.*

to provide for a smooth transition to digital television.[65] The Commission took special note of the fact that the proposed standard resulted from a voluntary, consensus agreement within a broad and diverse representative industry group.[66] For these reasons the Commission decided to incorporate by reference in its rules the proposed DTV transmission standard.[67]

C. Standards Compliance for DSRC

Similar public benefit rationales strongly argue in favor of specifying compliance with the ASTM E2213-02 DSRC Standard for DSRC applications in the 5.9 GHz Band. While not a broadcast service, DSRC services will be deployed in many instances for public safety purposes across the nation's transportation networks, potentially reaching millions of Americans who travel by car, truck, rail or transit every day. Several of these applications, particular at border crossings and ports, will also support homeland security efforts. These and other public safety applications cannot tolerate potential interference from incompatible radio equipment. Alleviating these potential problems would be enhanced if public safety and private users were required to follow a common transmission standard.

Second, it is also the case that adopting the ASTM E2213-02 DSRC Standard will increase the availability of new products and services for consumers. For example, the

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[65] *See In the Matter of Advanced Television Systems and Their Impact Upon the Existing Broadcast Service*, MM Docket No. 87-268, Fourth Report and Order, 11 FCC Rcd 17771, 17787-90 (1996) ("*ATS Fourth R&O*").

[66] *Id.* at 17790-91.

[67] *See* 47 C.F.R. § 73.682(d).

Standards Writing Group has indicated to ITS America that there are no intellectual property issues associated with the use of the standard and, accordingly, that no licensing fee would need be incurred. Thus, equipment manufacturers would be less likely to develop their own proprietary systems to avoid paying such fees (or to be in a position to recoup licensing fees in the future). The cost of development would be cheaper without factoring in the cost of using proprietary technology. Manufacturers will introduce future devices into the market that will be backwards compatible, thus extending the life of their original equipment. New applications can be added to existing equipment over time while still retaining backward compatibility with other providers' equipment. All potential purchasers of DSRC equipment -- government, public safety, private industry and consumers – would have sufficient confidence to make the required investments to deploy these technologies. As a result, use of the band for DSRC applications will happen more quickly because of the assurance of current and future compatibility and the existence of the largest possible market.

Third, incorporating the standard into the Commission's rules will encourage technological innovation and competition. Equipment manufacturers can rely on the standard as a basis for competing by promoting interoperability,[68] thus further guaranteeing a potentially larger market than would otherwise be available without the

[68] In its analysis of the DTV transmission standard, the Commission recognized the importance of this same issue. Using the term "compatibility", the Commission concluded that a failure to impose a standard "might result in compatibility problems and increase the risk that consumer DTV equipment purchased in one city would not work well in another city; that a receiver would not display all the broadcast channels in a city; or that a digital television set purchases one year might not work several years later. Such results would hurt consumers and make it more difficult to preserve a universally available broadcast television service." *ATS Fourth R&O* at 17778.

standard. And, fourth, requiring adherence to the standard is the minimum regulation needed to ensure a smooth transition to using DSRC applications in the band. The Commission should also recognize that the decision to request standard compliance was reached, as was the case for the DTV transmission standard, through a voluntary, consensus based process involving all the key affected stakeholders: federal, state and local governments; public safety; and private industry from many sectors. This fact alone should give the Commission sufficient confidence that compliance with the ASTM E2213-02 DSRC Standard would be clearly in the public interest.

Finally, ITS America proposes that the Commission incorporate the ASTM E2213-02 DSRC Standard by reference in its Part 90 rules as it did for DTV. The Commission has used three approaches to specifying compliance with a standard in its Rules: reprint the standard in its entirety, incorporate it by reference or publish the standard as an Office of Engineering and Technology Bulletin. In the DTV approach, the Commission decided to incorporate the standard by reference, citing its page length (194 pages) and its easy availability through either the Commission's copying contractor or from the sponsoring standards-setting organization.[69] While not of equal length as the DTV standard, the ASTM E2213-02 DSRC Standard as approved numbers over 30 pages (still too lengthy to be easily reprinted in the Commission's rules). A copy of the standard document may be obtained from ASTM.[70] For these reasons, ITS America

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[69] *ATS Fourth R&O* at 17791-92. The reference to the DTV standard appears in the Commission's rules at 47 C.F.R. 73.682(d).

[70] The ASTM website is www.astm.org.

therefore recommends that the Commission incorporate by reference the ASTM E2213-02 DSRC Standard in its Part 90 rules for the 5.9 GHz Band. This Part 90 reference should identify the standard by a date certain, such as the date on which final approval of the standard by the responsible standards-setting organization is achieved. Further modifications to the May 10, 2002 approved standard are likely to be made after the date of this filing and during any rulemaking proceeding initiated by the Commission. ITS America and ASTM will coordinate to inform the Commission of any such changes so that the final and complete standard may be incorporated by reference in Part 90 pursuant to a resulting rulemaking order. After such date, any subsequent revisions or modifications to the standard, as well as subsequent layers currently under development, would therefore not be referenced in Part 90 and would not implicate any compliance requirements the Commission may adopt.[71]

D. DSRC Equipment Certification

Compliance with the ASTM E2213-02 DSRC Standard should also be required of DSRC equipment manufacturers. This would be best achieved through a further requirement that equipment-type certification be obtained from the Commission prior to the marketing of any DSRC device. Moreover, this requirement should significantly enhance the likelihood that interoperability in the band will be achieved: each and every DSRC device will transmit using the same technical protocols and band channelization structure regardless of the particular DSRC application(s) the device is designed to

[71] A future rulemaking proceeding would likely be the appropriate mechanism for the Commission to require compliance with any subsequent revisions or layers, or to any replacement of the ASTM E2213-02 DSRC Standard.

perform. Equipment manufacturers will likewise have the incentive to create equipment specifications based on the ASTM E2213-02 DSRC Standard knowing that they will have access to the largest possible market.

Such a requirement is consistent with existing language in Part 90 of the Commission's rules. Section 90.203 of the Commission's rules specify that radio transmitting equipment used for services authorized under Part 90 must be type certified by the Commission prior to its marketing and use.[72] Therefore, ITS America proposes that an equipment type certification requirement for DSRC be added to Part 90. Demonstrated compliance with the ASTM E2213-02 DSRC Standard should be required as a prerequisite to equipment-type certification under Part 90. This proposed rule would also invoke the certification procedures as found in subpart J of Part 2 of the Commission's rules.[73]

V. SERVICE DEFINITION AND ELIGIBILITY REQUIREMENTS

The Commission's *Report & Order* contemplated both public safety and private applications in the 5.9 GHz Band.[74] Of these, there is consensus that public safety will be dominant in the band and should be given priority over private transmissions. Nonetheless, the ITS community recommends that the band be designated for shared public safety and private services. As discussed below, the proposed band channelization

[72] 47 C.F.R. § 90.203(a) and (a)(2). The restrictions on marketing a covered device prior obtaining the type certification can be found at 47 C.F.R. §2.803. This restriction should also apply equally to DSRC radio transmitting equipment.

[73] 47 C.F.R. Part 2, subpart J.

[74] *Report & Order* at 18236.

plan and related technical protocols will permit channel sharing between public safety and private users. A public safety and private use designation will ensure that the band is put to its best and highest use for the greatest public benefit. It is not recommended, however, that the Commission adopt the same requirements for both public safety and private users on the basis of shared use. Licenses in the band should be made available to public safety applicants under one set of rules that, in some cases, would permit longer transmission ranges using higher power. Private licenses should be granted under a different set of rules where more limited transmission ranges and power levels would be authorized.

A. Definition of Public Safety Services

The proposed DSRC applications for public safety constitute a unique form of communications service. Traditionally, public safety entities have used spectrum – whether in the 450 MHz, 700 MHz, 800 MHz or, now, 4.9 GHz bands – for internal communications: a police car communicating with the station house; an ambulance communicating with a hospital emergency room, firemen communicating with each other at the scene of a fire, etc. It is expected that the 5.9 GHz Band will be used for DSRC applications transmitting these types of internal communications. However, the 5.9 GHz Band will permit public safety entities to communicate directly with the public in ways not previously available. For example, warning messages about road conditions or soon-to-arrive emergency vehicles can be sent to multiple vehicles approaching a congested area or the scene of an accident. These messages will be able to reach large numbers of

private vehicles unaffiliated with any public safety entity. This ability for public safety entities to "push" messages to the traveling public is perhaps unique.[75]

For this and other reasons, USDOT, ITS America and the Standards Writing Group have consistently advocated to the Commission that the definition of "public safety services" applicable to the band be as broad and inclusive as possible. Likely users of DSRC public safety applications include many of the "traditional" public safety providers: police, fire, transportation and medical emergency authorities. However, other likely applications will also include services to be provided by so-called "non-traditional" public safety providers such as transit agencies, railroads, private ambulances and others. The public service designation applied by the Commission in this instance should therefore reach these "non-traditional" public safety service providers and the full range of communications to be provided in the 5.9 GHz Band.

The ITS community has reached consensus that the definition of "public safety services" found in Section 309(j)(2) of the Communications Act, as amended, should be applied to the 5.9 GHz Band.[76] Enacted in 1997, Section 309(j)(2) provides an

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[75] A close analogy may be Highway Advisory Radio. In this radio service, government transportation agencies operate AM and FM radio stations for broadcasting traffic, weather and other traveler information along highways and around bridges and tunnels. These government agencies do not own or control the receiving radio units located in traveling cars and trucks. Among the differences with the proposed DSRC operations are, as described below, the shared nature of the frequencies in the 5.9 GHz Band and the non-broadcast, shared overlapping "communications zones" to be licensed to public safety and private applicants.

[76] 47 U.S.C. § 309(j)(2). Other candidate definitions can be found in 47 U.S.C. § 337(f)(1) and 47 C.F.R. § 90.20(a). Section 337(f)(1) is the definition of "public safety services" for purposes of the Commission's allocation of 24 MHz of spectrum, as directed by Congress, between 746 and 806 MHz. This provision provides:

exemption from auction for spectrum licensed by the Commission for "public safety radio services", which are defined in this part as services, including private internal radio services, used by State and local governments and non-government entities and including emergency road services provided by not-for-profit organizations, that (i) are used to protect the safety of life, health or property; and (ii) are not made commercially available to the public. According to the accompanying House-Senate Conference Report explaining the provision, this exemption extends to private internal radio services used by utilities, railroads, metropolitan transit systems, pipelines, private ambulances, and

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> The term "public safety services" means services -- (A) the sole or principal purpose of which is to protect the safety of life, health, or property; (B) that are provided-- (i) by State or local government entities; or (ii) by nongovernmental organizations that are authorized by a governmental entity whose primary mission is the provision of such services; and (C) that are not made commercially available to the public by the provider.

47 U.S.C. § 337(f)(1). In the recent 4.9 GHz allocation order, the FCC noted that this definition generally "limit[s]" uses of the 700 MHz Public Safety spectrum band to state and local emergency workers and non-governmental public safety providers authorized to provide such services by a governmental entity whose primary mission is to protect the safety of life, health, or property. *In the Matter of the 4.9 GHz Band Transferred from Federal Government Use*, Second Report and Order and Further Notice of Proposed Rulemaking, WT Docket No. 0-32, 17 FCC Rcd 3955, 3971 (2002) ("*4.9 GHz 2nd R&O*").

Section 90.20(a) of the Commission's rules, 47 C.F.R. § 90.20(a), identifies those classes of Public Safety entities that qualify for licenses in the Public Safety Radio Pool for various reserved frequency bands below 800 MHz. Identified Public Safety entities in the Public Safety Radio Pool include: Police Radio Service, Fire Radio Service, Highway Maintenance Radio Service, Forestry-Conservation Radio Service, Local Government Radio Service, Emergency Medical Radio Service, other medical services, rescue organizations, disabled persons, veterinarians, school buses and beach patrols. This list is also too narrow, as it does not clearly include the "non-traditional" public safety entities likely to seek licenses in the 5.9 GHz Band.

volunteer fire departments (the so-called "non-traditional" public safety providers).[77] This list, as noted by the Commission, is not exclusive but intended for illustrative purposes.[78]

Many of the entities expected to use the 5.9 GHz Band – such as transit agencies using buses and light rail, toll authorities, state and local departments of transportation, public works agencies, etc. – do not use their communications directly for the protection of life, health or property. They do, nonetheless, satisfy the two-prong test set forth by the Commission for qualifying as "non-traditional" public safety entities under Section 309(j)(2). First, these and other expected users of the band have an infrastructure they use primarily to provide essential public services to the population at large.[79] Second, these entities provide services upon which the public depends, that affects the daily lives of the public, and the interruption of which could have dangerous consequences.[80] Moreover, their facilities may be directly involved in an emergency or will have to

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[77] *See* H.R. Conf. Rep. No. 105-217, 105th Cong. Sess., at 192 ("*Conference Report*"). The House and Senate conferees further explained that the auction exemption for public safety radio services found in Section 309(j)(2) is "much broader" than the explicit definition of "public safety services" found in Section 337(f)(1). *Conference Report* at 192-93.

[78] *In the Matter of Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended*, WT Docket No. 99-87, Report and Order and Further Notice of Proposed Rulemaking, 15 FCC Rcd 22709, 22748 (2000) ("*Sections 309(j) and 337 R&O*").

[79] *Id.* at 22747. The Commission describes an "infrastructure" for this purpose as "fixed physical facilities that extend beyond the licensee's place of business to areas where the public at large live and work and are therefore exposed to adverse results stemming from a breakdown in the licensee's infrastructure." *Id.*

[80] *Id.*

interact with emergency authorities.[81] For example, a transportation department maintains and manages a highway and road infrastructure used primarily to provide essential services to the public every day. A breakdown in this infrastructure, such as caused by a multiple-vehicle accident, may create a dangerous condition affecting the public at large. Consequently, a transportation department needs reliable communications to respond to this and other dangerous incidents and to communicate with police, fire and medical authorities – as well as the public in the vicinity – that may be called to an accident scene. The Commission is therefore urged to apply the definition of "non-traditional" public safety entities found in Section 309(j)(2) to the 5.9 GHz Band.

ITS America further recommends that Section 309(j)(2) be read to encompass communications made by public safety entities directly to the traveling public in the 5.9 GHz Band. While these "non-internal" public safety communications are not explicitly addressed by Section 309(j)(2), the ITS community suggests that the legislative history of the provision supports a broad reading of the statute and would be consistent with the public interest goals underlying the allocation of the band for DSRC applications.[82]

B. Definition of Private Services

There is consensus in the ITS community that the 5.9 GHz Band should also be made available for private services. As described above, it is expected that private licensees will use the band for a variety of electronic payment services, data transfer for

[81] *See 4.9 GHz 2nd R&O* at 3971.

[82] The House-Senate conferees explicitly included, for example, within the auction exemption radio services used by not-for-profit organizations that offer emergency road services. *Conference Report* at 192. These services are assigned to the Public Safety Pool at the 530-1700 kHz frequency band. *See* 47 C.F.R. § 90.242.

vehicle diagnostics and repair, and commercial vehicle fleet management operations, among others. As is the case for public safety services to be made available in the band, the types of DSRC services to be offered by private licensees are not limited to private "internal" communications.

Private licensees will likely use the band for internal business purposes consistent with the Commission's application of this term in other bands.[83] However, these private licensees will also use the band to transfer data and conduct transactions with the general public. On-Board Units mounted on vehicles could be used to pay for a parking space, provide access to in-vehicle diagnostic systems, and download music or other entertainment files. These same On-Board Units could also download vehicle diagnostic and usage information when a car or truck is serviced. What is consistent about all of these "non-internal" private uses is in no instance will the private licensee be offering to the public a telecommunications service for payment.[84] While remaining ancillary to the private licensee's business purpose, the 5.9 GHz Band serves as the communications link

[83] *See, e.g., Sections 309(j) and 337 R&O* at 22742 (describing a "private internal radio service" as "a service in which the licensee does not make a profit, and all messages are transmitted between fixed operating positions located on premises controlled by the licensee and the associated fixed or mobile stations or other transmitting or receiving devices of the licensee, or between mobile stations or other transmitting or receiving devices of the licensee.").

[84] *See* 47 U.S.C. § 153 (defining a "telecommunications service" as the offering of telecommunications to the public for a fee).

facilitating that business. Such usage would be consistent with the Commission's *Report & Order* allocating the band for DSRC applications.[85]

In addition, a private licensee would be able to access On-Board Units installed in vehicles that are not associated with its particular license. Equipping every new vehicle produced or sold in the United States with On-Board Units is a primary goal of USDOT and ITS America. As described below, ITS America proposes that these On-Board Units be licensed by rule rather than licensed individually to the vehicle OEMs, the purchaser of a vehicle or some other entity. Once installed, however, a single On-Board Unit would be able to receive and transmit a variety of messages that may originate from Roadside Units held by different licensees, whether public safety or private.

In Part 90 of the Commission's rules, private "internal systems" are defined as "one in which all messages are transmitted between the fixed operating positions located on premises controlled by the licensee and the associated mobile stations or paging receivers of the licensee."[86] This definition, while reaching traditional private internal communications, does not fully encompass the types of communications that are expected to be used by private licensees in the 5.9 GHz Band: private licensees will transmit to On-Board Units not "associated" with their licensed fixed Roadside Units.

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[85] *See Report & Order* at 18235 (contemplating the use of the 5.9 GHz Band for fee collection applications at parking garages and other commercial establishments). Similarly, the Part 90 rules for the Industrial/Business Pool contemplate the use of those frequencies by eligible entities "… to operate stations for transmission of communications necessary to such activities of the licensee", including "[t]he operation of a commercial activity." 47 C.F.R. § 90.35(a) and (1).

[86] 47 C.F.R. § 90.7.

In the recent Multiple Address Service ("MAS") proceeding, the Commission added a further characteristic such that "private internal" services are neither "for-hire" nor "for-profit."[87] Or, as cited in the MAS proceeding, the most common characteristic of private internal services is that such systems "are not operated as a direct source of revenue, but rather as a means of internal communications to support the licensees' business operations or to protect the safety of their employees, customers, or the general public."[88] MAS licensees use the band for private internal radio communications to provide state lottery monitoring and administration (GTECH), remote utility meter reading (CellNet), security alarm monitoring (Radscan), and control of paging station transmitters (TeleBeeper and Unicom).[89] The Commission found in each instance that none of these licensees receives compensation for the transmission of messages, but, rather, use the MAS frequencies "in connection with and as an adjunct to [their] primary business … activit[y]."[90]

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[87] *In the Matter of Amendment of the Commission's Rules Regarding Multiple Address Systems*, WT Docket No. 97-81, Memorandum Opinion and Order, 16 FCC Rcd 12181, _12185-88 (2001) ("*MAS Memorandum Opinion and Order*"). In this proceeding, the Commission adopted in its MAS rules the following definition of private internal services as a "service where entities utilize frequencies purely for internal business purposes or public safety communications and not on a for-hire or for-profit basis." 47 C.F.R. § 101.1305.

[88] *MAS Memorandum Opinion and Order* at 12186 & n.26 (citing *Implementation of Section s 309(j) and 337 of the Communications Act of 1934, as Amended*, WT Docket No. 99-87, Notice of Proposed Rulemaking, 14 FCC Rcd 5206, 5226 (1999)).

[89] *See In the Matter of GTECH Corporation, CN WAN Corporation, Radscan of Detroit, Inc., TeleBeeper of New Mexico, Inc., and Unicom Corporation*, DA 98-0163, Memorandum Opinion and Order, 13 FCC Rcd 4290 (1998).

[90] *Id.* at 4294.

Private users of the 5.9 GHz Band are expected to use the band for services consistent with this Commission precedent. Whether it is to pay for parking, download an MP3 file, or relay diagnostic vehicle information, the use of the 5.9 GHz Band should only be as a means to support the licensees' business operations and not as a direct source of revenue. Accordingly, the following definition of "private services" is recommended for inclusion in the Commission's licensing and service rules for the band:

> "Private Radio Services" refers to a radio service used for data transmission between a licensee's fixed Roadside Unit located on premises controlled by the licensee and associated mobile On-Board Units of the licensee or non-associated mobile On-Board Units licensed by rule pursuant to this subpart, and is not offered as a telecommunications service or otherwise operated as a direct source of revenue, but is used to support the licensee's business operations or to protect the safety of their employees, customers, or the general public.

Consistent with this analysis, ITS America recommends that the definition of Dedicated Short Range Communications Service in Sections 90.7 and 90.371(a) of the Commission's rules[91] be changed to reflect the "private" as opposed to "commercial" nature of the band. Moreover, retaining the reference to "commercial environments" may be confusing, as the allocation is neither intended nor technically capable for CMRS-type services. Thus, the term "commercial environments" should be replaced with "private environments" in both sections to read:

> The use of non-voice radio techniques to transfer data over short distances between roadside and mobile radio units, between mobile units, and between portable and mobile units to perform operations related to the improvement of traffic flow, traffic safety and other intelligent transportation applications in a variety of public and <u>private</u> environments.[92]

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[91] 47 C.F.R. §§ 90.7 & 90.371(a).

[92] Emphasis added. Also, as described above in Section III.C., ITS America proposes that the word "non-voice" also be deleted from the definition. ITS America further proposes that reference be made in the definition to the types of permissible communications that a

VI. LICENSING APPROACH

There is consensus in the ITS community that the establishment of a Commission licensing regime is the most appropriate mechanism for making spectrum in the 5.9 GHz Band available to the public. Any such licensing regime must accurately reflect the nature of the services to be provided in the band. DSRC applications will use short-range, low power data transmissions of limited duration. Both public safety and private users should be eligible to hold licenses in the band on a co-primary, shared basis for designated site-specific "communications zones." FCC-certified frequency coordinator(s) would recommend the "most appropriate" frequencies/channel assignments. The methodology for making these recommendations should be consistent with the existing procedures for frequencies below 512 MHz to qualified public safety and private applicants. This proposed licensing regime would therefore render the 5.9 GHz Band ineligible for auctions. Further, ITS America recommends that unlicensed DSRC operations not be permitted in the band.

A. Communications Zones and Roadside Units

There is consensus that the most appropriate licensing scheme for the band is to use site-by-site, first-come/first-served licensing procedures. Applicants would apply to license individual fixed Roadside Units. Prospective licenses, public safety and private, should be required to include in any application the latitude and longitude of the proposed

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licensee may transmit in the band. Reference to new Section 90.391 (Permissible communications) is found in the proposed rules in Appendix C.

Roadside Unit(s).[93] Each licensed Roadside Unit would also correspond to a specific "communications zone" derived from the range and transmitter power levels proposed for the specific DSRC device and installation under that license. All transmissions, whether one-way or two-way, associated with a particular Roadside Unit would be required to take place within its corresponding communications zone.

Determining the applicable communications zone for a particular Roadside Unit is based on the analysis of several factors: the type of entity seeking a license, the type of proposed DSRC application, the requisite range for that application, the class of DSRC device, the transmitter power needed for that range for that application, how and where the Roadside Unit is to be installed, type (directional or omnidirectional), etc. First, the ASTM E2213-02 DSRC Standard describes four DSRC device classes of Roadside Units and On-Board Units according to maximum output power:

Device Class	Maximum Device Output Power
A	0 dBm
B	10 dBm
C	20 dBm
D	28.8 dBm

By setting forth the upper limits on device output power, these four device classes are intended to limited the potential interference with adjacent channels occupied by licensees operating in close proximity. Licensees would be limited to operating the designated class of device as determined by a frequency coordinator.

[93] Of course, each applicant would also need to show how it meets the relevant band eligibility requirements, either as a public safety or private entity, to be included in Part 90.

In addition, the proposed licensing scheme would also limit licensees to operating Roadside Units, fixed or mobile, in accordance with one of four installation classes. These further limits would dictate the maximum range of transmission (measured in meters) and the maximum transmitter power (measured in effective radiated isotropic power ("EIRP")) that can be radiated in a particular direction:[94]

Class	Maximum Transmitter Power	Maximum Transmission Range
Class 1	10 dBm EIRP	Up to 15 meters
Class 2	20 dBm EIRP	Up to 100 meters
Class 3	33 dBm EIRP	Up to 400 meters
Class 4	44.8 dBm EIRP	Up to 1000 meters

It is unlikely that a given DSRC application would need in every instance to use the maximum authorized transmitter power level and range. Additionally, these maximum transmitter power and maximum range may be further limited by proposed operating restrictions applicable to certain channels in the band, as described below.

Procedurally, a DSRC license applicant should be required to identify in its license application the specific class of DSRC device and installation it believes is most appropriate for the proposed DSRC application at the requested site of a Roadside Unit. A frequency coordinator should then review the class designations relative to the proposed DSRC application, site and adjacent licensees and determine if they are consistent. If not, the frequency coordinator should have the discretion to assign different device and/or installation classes, thus permitting either/or greater range and transmitter power or short range and lower power, as appropriate. These two types of class

[94] Further proposed with the table of DSRC power/range class designations is an antenna height gain correction factor to calculate the necessary transmitter power reduction where a Roadside Unit Antenna that is 6 meters or taller above the "roadway bed surface." *See* Section X.B. below.

designations are intended to simplify the application process and create a consistent licensing scheme for prospective licensees and frequency coordinators.

All of these technical elements contribute to a communications zone for a particular Roadside Unit, and it is in that communications zone where all DSRC transmissions associated with a particular license are to take place. Accordingly, the following definition of "communications zone" is proposed for inclusion in the Commission's Part 90 rules:

> The term *Communications Zone* refers to the transmission contour corresponding to individual fixed Roadside Units as described in a license application. The communications zone is determined based on the Roadside Unit installation class designation of maximum transmitter power and maximum transmitter range.

B. Public Safety Licensing

Under the proposed licensing regime, a public safety user, whether "traditional" or "non-traditional", may be eligible to be granted a license to operate on a site-specific basis for a designated class of communications zone. A licensed Roadside Unit could cover, for example, a transmitter for a toll plaza on a highway, interstate, thruway, bridge or tunnel. Such a license would most likely require only a communications zone only covering a single lane through a toll plaza. Thus, an installation class 1 or class 2 designation using class A or B devices would be appropriate. A public safety entity may also apply to place a Roadside Unit at a major highway/trunk road intersection for the transmission of messages on traffic conditions or for transit bus signal preemption. In this instance, an installation class 3 or class 4 designation and class C or D device may be appropriate. In addition, the proposed licensing regime would permit public safety

eligibles to seek a "ribbon" or "corridor" license for a Roadside Unit transmitting within a communications zone that runs the length of a highway, secondary road, etc., and would extend some distance along the rights-of-way.[95] A class 4 designation of higher power and longer range, and class D device designation, would likely be sought in this instance. For administrative ease, a public safety entity may seek authority to use up to six Roadside Units for transmission coverage of the same physical facility, such as a toll plaza, maintenance yard or highway "ribbon" or "corridor, under one license."[96] The applicant should have to identify, and the license should list, the specific site latitude and longitude of each authorized Roadside Unit and installation class designation.

Licensed communications zones would be permitted to overlap, whether of public safety licensees or private licensees, and vice versa. However, public safety warning messages should be given priority rights for transmission across shared channels and overlapping communications zones, as well as generally in the band. Applicants would be granted licenses on a first-come/first-served basis for specific sites of Roadside Units, subject to protocol sharing rules.

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[95] *See, e.g.*, 47 C.F.R. § 90.631(h) (authorizing " ribbon configuration systems" for licensees in the Public Safety Radio Pool and the Industrial/Business Radio Pool in the 806-824 MHz, 851-869 MHz, 896-901 MHz, and 935-940 MHz bans.).

[96] Any rules adopted by the Commission should also include the option for Public Safety licensees to seek "temporary" authorization for additional Roadside Units to more fully cover a "ribbon" or "corridor" geographic area. Such "temporary" Roadside Units may also be movable to permit a highway agency, for example, to move a Roadside Unit to cover temporary work zones, major accidents, etc. *See* 47 C.F.R. § 90.137.

C. Private Licensing

Similarly, private users would apply for a site-specific license associated with a Roadside Unit at a gas station, truck stop, etc. They too would be required to identify the device class and transmission power and range for the installation class designation, and resulting communications zone, for each licensed Roadside Unit. Up to six Roadside Units may be authorized under a single license with the latitude and longitude and class designations identified for each.[97] As noted above, both public safety and private communications zones may overlap one another. Directional antennas would again be recommended to guard against harmful interference to adjacent communications zones and public safety communications zones that may overlap. Private applicants would also be granted licenses on a first-come/first-served basis for site specific Roadside Units, subject to protocol sharing rules.

D. On-Board Units

A goal of the ITS community is to have all vehicles – passenger cars, commercial trucks, transit buses, etc. – manufactured and sold in the United States be equipped with a DSRC On-Board Unit.[98] Each year this would introduce literally millions of On-Board Units into the marketplace. However, given these potentially large numbers and the nature of DSRC services, licensing each unit would be both impractical and a significant

[97] It is not recommended, however, that "temporary" licenses for such movable Roadside Units be available to private licensees.

[98] Recently, seven major vehicle OEMS – BMW, DaimlerChrysler, Ford, General Motors, Nissan, Toyota and Volkswagen – announced the formation of the "Vehicle Safety Communications Consortium" to pursue the use of the 5.9 GHz Band for DSRC safety applications for passenger and commercial vehicles.

administrative burden for the Commission. Requiring individual unit licensing would also likely slow deployment of the devices. Vehicle original equipment manufacturers ("vehicle OEMs") would not want the responsibility of obtaining the licenses and would see the licensing requirement as an impediment to vehicle sales. Section 307(e) of the Communications Act, as amended, permits the Commission to authorize by rule the operation of radio stations without individual licenses in the following radio services: (A) the citizens band radio service; (B) the radio control service; (C) the aviation radio service; and (D) the maritime radio service for ship stations.[99] In the *Report & Order*, the Commission suggested that it would consider authorizing certain DSRC applications either as unlicensed or licensed-by-rule depending on the needed technical requirements.[100] The consensus view of the ITS community is that On-Board Units are most appropriately licensed by rule.

The characteristics of On-Board Units are most similar to the citizens band radio service. According to Section 95.401(a) of the Commission's rules, the Citizens Band (CB) Radio Service is "a private, two-way, short-distance communications service for personal or business activities of the general public."[101] The Commission has previously applied an expansive definition of the citizens band radio service to include wireless

[99] 47 U.S.C. § 307(e).

[100] *Report & Order* at 18235-36.

[101] 47 C.F.R. § 95.401(a). The Radio Control (R/C) Service is deemed a "private, one-way, short distance non-voice communications service for the operation of devices at remote locations." *Id.* at § 95.201. While similar, some DSRC applications will utilize two-way transmission capabilities. The remaining two candidate services, the aviation radio service and the maritime radio service for ship stations, are more obviously inappropriate analogies for the 5.9 GHz Band.

medical telemetry services ("WMTS").[102] In reaching this conclusion, the Commission noted that the WMTS spectrum would be shared among multiple users without mutual exclusivity.[103] Moreover, operators of the service will not be in competition with each other.[104] Individual licensing, according to the Commission, is intended to give a licensee a protected service area and establish rights among competitors.[105] The Commission also noted that licensing by rule would minimize its regulatory procedures, thus facilitating deployment of the service.[106] Therefore, the Commission exercised its authority to define the citizen's band radio service and license the WMTS spectrum by rule.[107]

A similar analysis and result is appropriate for licensing by rule On-Board Units. These devices will operate at short distances and low power. Because they will be installed on vehicles (and likely also used as handheld, portable devices),[108] there is no need to designate a protected service area for their operation. Operators of the units will

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[102] *See In the Matter of Amendment of Parts 2 and 95 of the Commission's Rules to Create a Wireless Medical Telemetry Service*, ET Docket No. 99-255, Report and Order (proceeding terminated), 15 FCC Rcd 11206 (2000).

[103] *Id.* at 11216.

[104] *Id.*

[105] *Id.*

[106] *Id.*

[107] *Id.* (citing 47 U.S.C. § 307(e)(1) and (3)).

[108] ITS America recommends that handheld, portable DSRC devices should also be licensed by rule rather than individually licensed. Technical operating rules for portable On-Board Units are offered in Appendix C.

not be competing with each other and do not need exclusive rights to either a protected service area or spectrum. Most importantly, licensing On-Board Units will minimize regulatory obstacles to their use, thus further spurring deployment.

Currently, the ASTM E2212-02 DSRC Standard contemplates that portable On-Board Units should be individually licensed. The issue of the appropriate licensing procedures for portable On-Board Units is now under review by the Standards Writing Group. Any subsequent changes to the standard should be concluded shortly with any necessary changes to be submitted to the Commission as part of a rulemaking proceeding. ITS America's recommendation that On-Board Units be licensed by rule, including portable On-Board Units, is reflected in the proposed licensing and service rules that appear in Appendix C.

E. No Licensing By Auction

ITS America recommends that the Commission not seek to award licenses in the 5.9 GHz Band by auction. First, the dominant use of the 5.9 GHz Band is expected to be public safety applications. Pursuant to Section 309(j)(2)(A),[109] the competitive bidding requirement in Section 309(j)(1)[110] is not applicable to spectrum designated for public safety services. Second, the proposed licensing regime, if adopted, would not result in the filing of mutually exclusive applications. Individual private applicants would receive authority to transmit from a specific location identified by latitude and longitude. Adjacent licensed sites may be closely located such that the communications zone of one

[109] *Id.* at § 309(j)(2)(A).

[110] 47 U.S.C. § 309(j)(1).

Roadside Unit overlaps that of a Roadside Unit licensing to another entity. Thus, the proposed band channelization plan, discussed below, provides for shared channel use between public safety and private licensees rather than mutual exclusivity.[111]

Third, pursuant to Section 309(j)(6)(E),[112] the Commission remains obligated to consider the public interest in using engineering solutions, negotiation, threshold qualifications, service regulations and other means to avoid mutual exclusivity in application and licensing procedures. The public interest in this instance speaks clearly to a conclusion that mutual exclusivity may also be avoided pursuant to Section 309(j)(6)(E).[113]

Fourth, as will be described below, ITS America proposes that FCC-certified frequency coordinators be used to process applications and implement measures to control potential interference to adjacent or co-channel sharing licensees. This should further ensure that mutually exclusive applications are not filed. Fifth, licenses will be made available on a first-come/first-served basis for requested sites. Finally, there is no

[111] ITS America proposes that Section 90.173(a), 47 C.F.R. § 90.173(a), be amended to reference the 5.9 GHz Band such that frequencies in this band assigned to specific Roadside Units are available only on a shared basis and will not be assigned for the exclusive use of any licensee, public safety or private.

[112] *Id.* at § 309(j)(6)(E).

[113] Recently, the Commission affirmed the use of alternative methods to resolve potentially mutually exclusive applications for spectrum from competitive bidding. The Commission cited the use of first-come/first-served licensing procedures and frequency coordination as particularly effective. Other procedures are also available to the Commission, such as finding alternative spectrum, developing engineering solutions, dismissing applications or comparative hearings. *See Sections 309(j) and 337 R&O* at 22752-53.

statutory requirement that the FCC must use auctions to allocate the 5.9 GHz Band to individual licensees, whether public safety or private applicants.

F. Unlicensed DSRC Operations

The prospect of unlicensed DSRC operations in the band was also considered. The consensus conclusion is that such operations should not be permitted. Allowing unlicensed operations implicates two concerns. First, as discussed above, the dominant use of the 5.9 GHz Band is expected to be for public safety. Potential interference to these users must be minimized. Permitting unlicensed DSRC operations outside the purview of a frequency coordinator would undermine the ability of such a coordinator to protect the public safety licensees from interference. Second, unlicensed DSRC operations would threaten the integrity of the band for its designated purposes, both public safety and private, for licensed DSRC-related applications.

VII. BAND CHANNELIZATION PLAN

The Standards Writing Group reached consensus that a variant of the IEEE 802.11a is the most appropriate transmission standard for DSRC operations in the band. This approach would best meet the user requirements as well as provide a competitive supply of equipment at the lowest cost. However, to satisfy the communications range and vehicle speed characteristics necessary to complete a successful transmission in highly reflective urban multi-path locations, the IEEE 802.11a standard was modified by reducing the clock frequency, data rates, and channel bandwidths by a factor of two to provide more robust and reliable communications. Chip manufacturers should be able to incorporate this technique in a dual-band application without significant difficulty, thus promoting more widespread compatibility. This calculation results in channel

bandwidths of 10 MHz each with possible data rates to be selected of between 6 Mbit/s and 27 Mbit/s.[114] The ASTM E2213-02 DSRC Standard takes its channel numbering scheme from the IEEE 802.11a standard variant and the UNII band at 5735-5815 MHz to prevent channel selection discrepancies in dual mode devices. In addition, analysis by the Standards Writing Group indicated that a vehicle-mounted On-Board Unit could not meet performance requirements using a channel scanning procedure. Therefore, unique technical requirements were developed by the Standards Writing Group to enable DSRC equipment to meet the desired operational characteristics.

A. Band Channels

The Standards Writing Group reached consensus that the 75 MHz in the 5.9 GHz Band is best divided into seven channels of 10 MHz each as follows:[115]

- Channel 172: 5855-5865 MHz
- Channel 174: 5865-5875 MHz
- Channel 176: 5875-5885 MHz
- Channel 178: 5885-5895 MHz
- Channel 180: 5895-5905 MHz
- Channel 182: 5905-5915 MHz
- Channel 184: 5915-5925 MHz

[114] Specified data rates are included in the ASTM E2213-02 DSRC Standard. Using an Orthogonal Frequency Division Multiplexing ("OFDM") modulation system, the Control Channel and Service Channels can support data transmission at the rates of 3, 4.5, 6, 9, 12, 18, 24 and 27 Mbit/s. If optional channel combinations of 20 MHz are used, additional data transmission rates can be achieved of 6, 9, 12, 18, 24, 36, 48 and 54 Mbit/s. The standard requires the support of data rates of 6, 9 and 12 Mbit/s for all channels and applications. (On the Control Channel only, preambles to messages may be transmitted at 3 Mbit/s, but the messages themselves must be transmitted at no less than 6 Mbit/s.)

[115] Channels 174 and 176 and 180 and 182 may be combined as Channels 175 and 181, respectively, as 20 MHz channels if authorized by a frequency coordinator. Charts illustrating the 10 MHz and 20 MHz channel band plans, and associated power limits, appear as Appendix D.

The five (5) megahertz from 5850-5855 would not be initially available for licensing, but would remain in reserve for future DSRC applications. The key element of the proposed band plan is the use of a Control Channel (Channel 178) on which short messages, announcements and public safety warnings would be transmitted to all On-Board Units in a particular public safety communications zone. The remaining six channels would be designated as Service Channels dedicated to specific applications and types of messages. Separating different uses between the Control Channel and Service Channels is intended to maximize efficiency and quality of service in the band and minimize interference between services. The proposed band plan would also accommodate the original data rates, frequencies, and channel bandwidths founds in IEEE 802.11a by combining one of two 10 MHz channel pairs into 20 MHz channels. The proposed channel assignments take into consideration coordination with Canadian regulations and frequency assignments. The numbering scheme is also consistent with IEEE 802.11a.

B. Control Channel

Channel 178, at 5885-5895 MHz, would be designated as the Control Channel for the band. The ASTM E2213-02 DSRC Standard is prepared with the assumption that there will be additional higher layer aspects to the standard, including Control Channel access. ITS America understands that the Standards Writing Group is studying possible Control Channel use limitations to enable shared use. Specific limitations may include a requirement that all On-Board Units automatically select and monitor the Control Channel and wait for announcements, data transfers or warning messages from Roadside Units. Further, to accommodate these operating protocols, all transmissions on the Control Channel would be limited to a short duration of no more than 200 microseconds

and may be repeated only at prescribed intervals. Currently, these protocols are not included in the ASTM E2213-02 DSRC Standard, but are expected to be finalized and available for Commission consideration as part of any future rulemaking proceeding.

Public safety and private shared use of the Control Channel is needed to ensure that public safety warning announcements, such as for emergency vehicle priority access or an upcoming work zone, are received by all On-Board Units within that particular public safety communications zone. In these instances, the public safety warning would have priority over all private messages that may be transmitting or seeking to transmit on the Control Channel. This requirement is included in the standard to assure that the needs of public safety are not compromised. For private messages longer than the prescribed limit, the standard provides that they be conducted on one of the Service Channels. Short, private transactions can be completed without switching to a Service Channel. After the transmission is completed, the affected On-Board Units would then switch back to monitoring the Control Channel to wait for further instructions or to transmit any public safety warnings.

C. Service Channels

The remaining six channels (172, 174, 176, 180, 182 and 184) are to be made available as Service Channels either for designated applications (such as vehicle data transfer for diagnostic or repair purposes or vehicle-to-vehicle safety related communications) or to transmit other data messages – public safety and private – too large for transmission on the Control Channel. The standard further proposes that specific services be assigned to individual Service Channels. However, these assignments are intended to be flexible. If, for example, one channel is found inadequate

to handle the capacity needed by its assigned application, additional channels may be also assigned to meet the capacity demands.

The following are the proposed Service Channel assignments recommended in the standard:

- Channel 172 should be designated for public safety and private vehicle-to-vehicle communications.
- Channel pairs 174/176 and 180/182 may be combined to create two 20 MHz channels (designated Channels 175 and 181, respectively). A license should expressly authorize the channel pairing.
- All six Service Channels should support shared public safety and private operations.
- Channel 184 should be designated as the primary channel for high-power, coordinated Roadside Unit applications conducted by public safety users. Private users may use the channel when authorized by a frequency coordinator, but with the potential for interference from such high power public safety applications.

In Channel 172, proposed primarily for vehicle-to-vehicle communications, ITS America understands that the Standards Writing Group is examining possible limitations on the size of messages transmitted in the channel. ITS America will keep the Commission informed on this issue.

D. Public Safety and Private Use Channel Sharing

A second key characteristic of the proposed band channelization plan is shared public safety and private use of the 5.9 GHz Band. As described above, all users should operate on a shared basis across the spectrum rather than be granted discrete channel designations. Specific services may be assigned a primary Service Channel for operation, but all On-Board Units, public safety and private, would generally select and monitor the Control Channel at times when not transmitting or receiving on a Shared Channel. It is also possible that communications zones licensed to both public safety and private users

could overlap. Public safety warning messages should therefore be given priority over all other messages on the Control Channel.

Under the ASTM E2213-02 DSRC Standard, shared use of the channels would be possible by using "listen before transmit" techniques.[116] Transmitting messages in accordance with the prescribed time limit and only at specified intervals would also facilitate shared use of the Control Channel. Other technical procedures, as described in the standard, would permit the processing of priority public safety warning messages on the Control Channel. ITS America further recommends that transmitter power limits be tailored to correspond to the type of application and proposed transmission range zones sought by a license applicant.[117]

The Commission in its Part 90 rules already contemplates the use of "listen-before-transmit" techniques. For example, trunked systems in the bands between 150 and 512 MHz must employ equipment that prevents transmission on a trunked frequency if a signal from another system is present on that frequency.[118] More generally, the Commission's Part 90 rules provide that private land mobile licensees operating on a shared frequency basis with other licensees are to take reasonable steps to avoid causing

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[116] One such technique, called Carrier Sense Multiple Access ("CSMA") may be appropriate for this purpose in the band. CMSA is a "protocol by which all nodes attached to the network contend for access and listen if another PC is transmitting. If not, it starts to transmit or it waits to retransmit if it detects another station's jam signal." *Broadband Today: A Staff Report to William Kennard, Chairman, Federal Communications Commission, On Industry Monitoring Sessions Convened by Cable Services Bureau*, 69 (1999).

[117] These limits are discussed more extensively in Sections VI.A., *supra* and X.A., *infra*.

[118] 47 C.F.R. § 90.187(b).

harmful interference, including using techniques to monitor a transmitting frequency for communications progress before transmitting.[119] ITS America proposes that a similar transmit requirement is needed for licensed operations in the 5.9 GHz Band.

VIII. FREQUENCY COORDINATION

There is consensus that FCC-certified frequency coordinators are most appropriate for licensing and resolving potential interference problems. Public safety and private licensees will be granted site-specific communications zones located, in some instances, adjacent or overlapping one another. This should make it possible to license a high density of users in a given area without implicating mutual exclusivity. It is believed that the use of FCC-certified frequency coordinators would therefore be the most efficient means for identifying and resolving potential interference between adjacent licensees or overlapping licensees.

To speed deployment within the 5.9 GHz Band, ITS America proposes that FCC-certified frequency coordinators for existing public safety and private bands be authorized to coordinate use in the 5.9 GHz Band in accordance with their current band responsibilities. In other words, public safety coordinators would coordinate public safety applicants. Similarly, private frequency coordinators would be responsible for private applicants. All certified public safety and private frequency coordinators would be eligible to coordinate licenses in the 5.9 GHz Band.

Under this proposal, a frequency coordinator would verify that a license applicant would not be implementing a communications zone unnecessarily large or producing

[119] *Id.* at § 90.403(e).

excessive interference contours[120] relative to the proposed DSRC application. In the case of overlapping or adjacent communications zones within the same interference contour, the frequency coordinator would attempt to minimize potential interference by assigning different Service Channels, if available, among the applicants. Technical elements on the standard should also assist the frequency coordinators. "Listen-before-transmit" techniques should facilitate channel sharing. Moreover, a frequency coordinator could require that a licensee use a directional antenna to further limit harmful interference.

In approving a specific application, the frequency coordinator would review and specify the maximum authorized transmitter output power and range, the class designation, for that licensee's Roadside Unit(s). The coordinator would also designate those Service Channels (one or more) on which that licensee could operate. These and other elements of any granted license should be based on a close examination by the frequency coordinator of the technical requirements of providing the proposed DSRC application within the requested communications zone.

Once again Part 90 of the Commission's Rules already provides a mechanism for frequency coordination. For example, in Section 90.173, licensees in the public safety Radio Pool, Industrial/Business Radio Pool and Radiolocation Service are required to share frequencies.[121] To enable this frequency sharing, the Part 90 rules also provide for

[120] The proposed interference contour is for a received power level of –88 dBm measured where the height of the antenna feed of the On-Board Unit is at 1.2 meters above the roadway bed surface with a 0 dBi antenna in the applicable channel.

[121] 47 C.F.R. § 90.173(a).

frequency coordination as part of the licensing process.[122] ITS America proposes that these or similar provisions be applied to DSRC operations in the 5.9 GHz Band.

IX. CONSTRUCTION REQUIREMENTS

Consistent with Section 90.155 of the Commission's rules,[123] ITS America proposes that authorized Roadside Units should be placed in operation within 12 months from the date of license grant or the authorization cancels automatically and must be returned to the Commission. This one-year construction requirement would apply both to public safety and private applicants. For applications encompassing multiple Roadside Units as part of a single license, all proposed Roadside Units should be placed in operation within a year of the license grant (unless an extended construction period is approved as discussed below).[124] A license grant should be for a period of 10 years.

Public safety applicants seeking authorization to construct and operate Roadside Units to serve a single physical facility or in a "ribbon" or "corridor" should be able to seek an extended deployment period in accordance with Section 90.629 of the

[122] *Id.* at §§ 90.175 and 90.176.

[123] 47 C.F.R. § 90.155.

[124] The requirement in Section 90.155(c) that a fixed Roadside Unit would not be considered placed in operation unless at least one associated On-Board Unit is also placed in operation is inappropriate for the 5.9 GHz Band. While Public Safety and private licensees may equip their own vehicles with On-Board units for internal communications, it is expected that the majority of On-Board Units will be licensed by rule without any specific association to a Roadside Unit licensee. Moreover, both public safety and private licensees would be able to transmit to a single On-Board Unit in a vehicle for both public safety and non-public safety messages. Therefore, it is not practical to require license applicants to show compliance with Section 90.155(c) for satisfying with the Commission's construction requirements.

Commission's rules.[125] Qualifying public safety applicants would therefore have up to five years to construct and place into operation the proposed Roadside Units identified in the application. As further described in Section 90.629, public safety applicants may seek the extended implementation period by showing that:

> (1) The proposed system will require longer than 12 (twelve) months to construct and place in operation because of its purpose, size, or complexity; or
> (2) The proposed system is to be part of a coordinated or integrated wide-area system which will require more than twelve (12) months to plan, approve, fund, construct, and place in operation; or
> (3) The applicant is required by law to follow a multi-year cycle for planning, approval, funding, and purchasing the proposed system.[126]

Any such applicants must also include a justification that sets forth with reasonable detail a description of the proposed system, the amount of time necessary to construct and place the system in operation, and identify the number of Roadside Units to be constructed and placed in operation during each year of requested extended implementation period.[127] Moreover, in cases where the proposed system is required by law to follow a multi-year planning, construction and deployment cycle, the public safety applicant must indicate on the application whether the necessary funding has been obtained and, if not, when such funding is expected.[128] Finally, such an applicant must report annually to the Commission in accordance with Section 90.629(c)[129] that they are in compliance with the

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[125] *Id.* at § 90.629.

[126] *Id.* at § 90.629(a)(1), (2) and (3).

[127] *Id.* at § 90.629(a).

[128] *Id.* at § 90.629(b).

[129] *Id.* at § 90.629(c).

yearly construction requirements in accordance with the approved plan under Section 90.629(a).

X. MISCELLANEOUS TECHNICAL CHARACTERISTICS

In the *Report & Order*, the Commission adopted a set of initial technical rules to govern deployment of devices in the band. These rules address power limits, unwanted emissions limits and radiofrequency guidelines. A description of these rules is provided below and followed by a discussion of the consensus recommendations now offered by the ITS community. Also discussed are additional technical issues pertaining to the proposed band channelization plan, frequency coordination, standards compliance and operational characteristics of Roadside and On-Board Units.

A. Transmitter Power Limits

In the *Report & Order*, the Commission adopted the following power limits for DSRC devices operating in the band:

> The peak transmit output power over the frequency band of operations shall not exceed 750 mW or 28.8 dBm with up to 16 dBi in antenna gain. If transmitting antennas of directional gain greater than 16 dBi are used, the peak transmit output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 16 dBi, *i.e.*, the device's maximum EIRP shall not exceed 30 W EIRP. However, the peak transmitter output power may be increased to account for any line losses due to long transmission cables between the transmitter and the DSRC device's antenna, provided the EIRP does not exceed 30 W.[130]

The proposed transmitter power limits in the ASTM E2213-02 DSRC Standard conforms to these limits. Most devices, Roadside Units and On-Board Units, are expected to use less power than the maximum established by the Commission: 28.8 dBm

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[130] *Report & Order* at 18232.

(750 mW), measured at the antenna input, and 30 watts (44.8 dBm) of EIRP. Specific limitations on channels and categories of applications are recommended as listed below. These suggested power limits are intended to provide only that power needed for transmission based on the type of application and the needed transmission distance.

- Public safety and private Roadside Units operating in Channels 174, 175 and 176 should be used to implement small and medium range operations. Any Roadside Unit installation transmitting in these channels should not exceed 28.8 dBm antenna input power and 33 dBm EIRP.
- Private use Roadside Units operating in Channel 178 should not exceed 28.8 dBm antenna input power and 33 dBm EIRP.
- Public Safety Roadside Units operating in Channel 178 should not exceed an antenna input power of 28.8 dBm and 44.8 EIRP.
- Channels 180, 181 and 182 should be used to implement small zone operations. Public safety and Private Roadside Units operating in these channels should not exceed 10 dBm antenna input power and 23 dBm EIRP. These Roadside Units should also use an antenna with a minimum 6 dBi gain.
- Public safety Roadside Units operating in Channel 184 should not exceed 28.8 dBm antenna input power and 40 dBm EIRP. Private Roadside Units operating in Channel 184 should not exceed an antenna input power of 28.8 dBm and 33 dBm EIRP.
- Private On-Board Units operating in Channels 172, 174, 175, 176, 178 and 184 should not exceed 28.8 dBm antenna input power and 33 dBm EIRP. Private On-Board Units operating in Channels 180, 182 and 181 shall not exceed 20 dBm antenna input power and 23 dBm EIRP.
- Public safety On-Board Units operating in Channels 172, 174, 175 and 176 should not exceed 28.8 dBm antenna input power and 33 dBm EIRP.
- Public safety On-Board Units operating in Channel 178 should not exceed 28.8 dBm antenna input power and 44.8 dBm EIRP.[131]

B. Antennas

While not addressed in the Commission's allocation *Report & Order,* ITS America proposes that technical rules be included in Part 90 for the location of antennas on Roadside Units. In most instances, it is expected that a directional antenna will be employed, especially in those instances where only class 1 installation designation is

[131] The band channelization charts at Appendix D illustrate these power limitations.

needed. For example, a Roadside Unit transmitting at a tollbooth needs limited power and range with only a few degrees of coverage. There may be instances, however, where an omnidirectional antenna at increased power and range is more appropriate. For example, a highway agency may want to operate an omnidirectional antenna with a class 4 installation designation for 360-degree coverage of a multi-lane intersection. There is a concern in the ITS community that antennas, whether directional or omnidirectional but especially those with higher transmitter power levels, placed higher than six meters above the roadway bed surface[132] might create a strong likelihood of interference with other licensees with adjacent or overlapping communications zones. ITS America proposes, therefore, that an antenna height gain correction factor operation be included in the Commission's Part 90 rules.

The purpose of the antenna height correction factor is to compensate for increased transmitter power where an antenna is six to 15 meters above the roadway bed surface. At six meters or lower, there is an increased likelihood that the signal would be obstructed the further out it travels with an attendant rapid loss in power. At a certain distance, a "break point" would also be reached in the signal strength such that another

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[132] The transportation community generally uses the term "roadway bed surface" to refer to the road surface at ground level (as opposed to the road surface on a bridge or overpass). Measuring the height of a Roadside Unit antenna above the roadway bed surface should provide a more accurate measurement of the antenna height relative to the location of traveling vehicles. For example, an antenna may be placed on a hillside that overlooks a highway. While it may be six meters or less in height above the ground, it may be actually be higher in relation to the roadway bed surface. Likewise, an antenna may be placed on the underside of a bridge or overpass pointing down. In this instance, the height of the antenna would be measured relative to the roadway bed surface it is pointed toward.

transmitting Roadside Unit may reuse the frequency. However, where an antenna is placed six or more meters above the roadway bed surface, it is less likely that it would encounter a surface obstruction and the attendant signal "break point" would likewise be extended. The potential risk of harmful interference to other Roadside Units is further increased where a higher power transmitter, such as a class 3 or 4 device designation and a class 3 or 4 installation designation, is employed by an antenna of a height over six meters.

Therefore, ITS America recommends that the Commission's Part 90 rules for the band include a formula to compensate for increased power where an antenna stands between six and 15 meters. Such a formula has previously been written into the Commission's rules for Phase I licensees in the 220-222 MHz band.[133] The proposed antenna height gain correction factor for the 5.9 GHz Band assumes that the receiving On-Board Units, such as those placed on windshields of cars, stand typically one meter above the roadway bed surface. The recommended antenna height gain correction factor should read:

> Reduce authorized effective radiated power ("ERP") by a factor of 20 log (Ht/6) in dB where Ht is the height of the radiation center of the antenna in meters above the roadway bed surface where the antenna height is between 6 and 15 meters (or 6m<Ht<15m). ERP is measured as the maximum ERP toward the horizon or horizontal, whichever is greater, of the gain associated with the main or center of the transmission beam. The maximum authorized effective isotropic radiated power ("EIRP") is 33 dBm for any Roadside Unit installation where the antenna height is six meters or greater above the roadway bed surface. A waiver of the antenna height correction factor, and the resulting height-gain power reduction,

[133] *See* 47 C.F.R. § 90.745(a). In this instance, antenna height is measured as height-above-average terrain based on the Phase I licensee's authorized geographic service area. Because site-by-site licensing is proposed for the 5.9 GHz Band, an antenna height measurement based on height-above-average terrain is inappropriate.

> may be requested for an antenna height greater than six meters above the roadway bed surface and must be accompanied by an engineering study justifying such a waiver. Waivers can be recommended at the discretion of a frequency coordinator upon a determination that the proposed Roadside Unit installation will follow reasonable and generally accepted engineering practices and that potential co-channel interference is properly minimized.

For example, a Roadside Unit antenna may be located on the underside of a bridge transmitting down toward the roadway bed surface more than six meters below. As stated in the proposed formula, the permitted EIRP would be 33 dBm for this antenna. If the antenna is pointing straight into the ground, the antenna may already have less than 33 dBm toward the horizon or horizontal simply because of the antenna direction. If, however, the antenna is tilted at an angle away from the ground, the antenna gain in the direction of the horizon or horizontal may be greater than 33 dBm power limit. The power toward either the horizon or horizontal would have to be reduced (33 dBm minus the correction formula). The antenna could still transmit at 33 dBm in the desired direction so long as the power toward either the horizon or horizontal is reduced accordingly.

C. Emissions Limits

The Commission concluded in the *Report & Order* that it is necessary to limit the amount of unwanted emissions, including those occurring outside the band and those emanating from one channel to another within the band.[134] Accordingly, the Commission adopted the emission mask requirements of Section 90.210(k)[135] of its rules for DSRC devices in the band. Under the ASTM E2213-02 DSRC Standard, the power in the

[134] *Report & Order* at 18233.

[135] 47 C.F.R. § 90.210(k).

transmitted spectrum for all DSRC devices should be –25 dBm or less in 100 kHz outside all channel and band edges. This would be accomplished by attenuating the transmitted signal in 100 kHz outside the channel and band edges by 55 + 10 log(P) dB, where P is the total transmitted power in watts. This is consistent with Section 90.210(k).

D. Radiofrequency Guidelines

While noting that the low power nature of DSRC devices does not raise concerns about public exposure to excessive radiofrequency ("RF") energy, the Commission nonetheless required that all DSRC operations in the band must comply with the RF safety guidelines as set forth in its ET Docket No. 92-62.[136] There is consensus that the guidelines established in this docket are appropriate for all DSRC operations in the 5.9 GHz Band.

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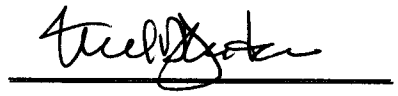
[136] *Report & Order* at 18234 (citing *In the Matter of Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, ET Docket No. 93-62, Second Memorandum Opinion and Order and Further Notice of Proposed Rulemaking, 12 FCC Rcd 13494, 13501-08 (1997)). *See also* 47 C.F.R. § 1.1307(b).

XI. CONCLUSION

In deciding to allocate the 5.9 GHz Band for DSRC, the Commission has already recognized the many important public benefits associated with these applications and services. ITS America believes that the proposed licensing and service rules contained herein will realize these public benefits and put the band to the highest and best use while ensuring national interoperability. ITS America therefore requests that the Commission consider these recommendations in any rulemaking proceeding for the band the Commission may initiate.

Respectfully submitted,

By: 

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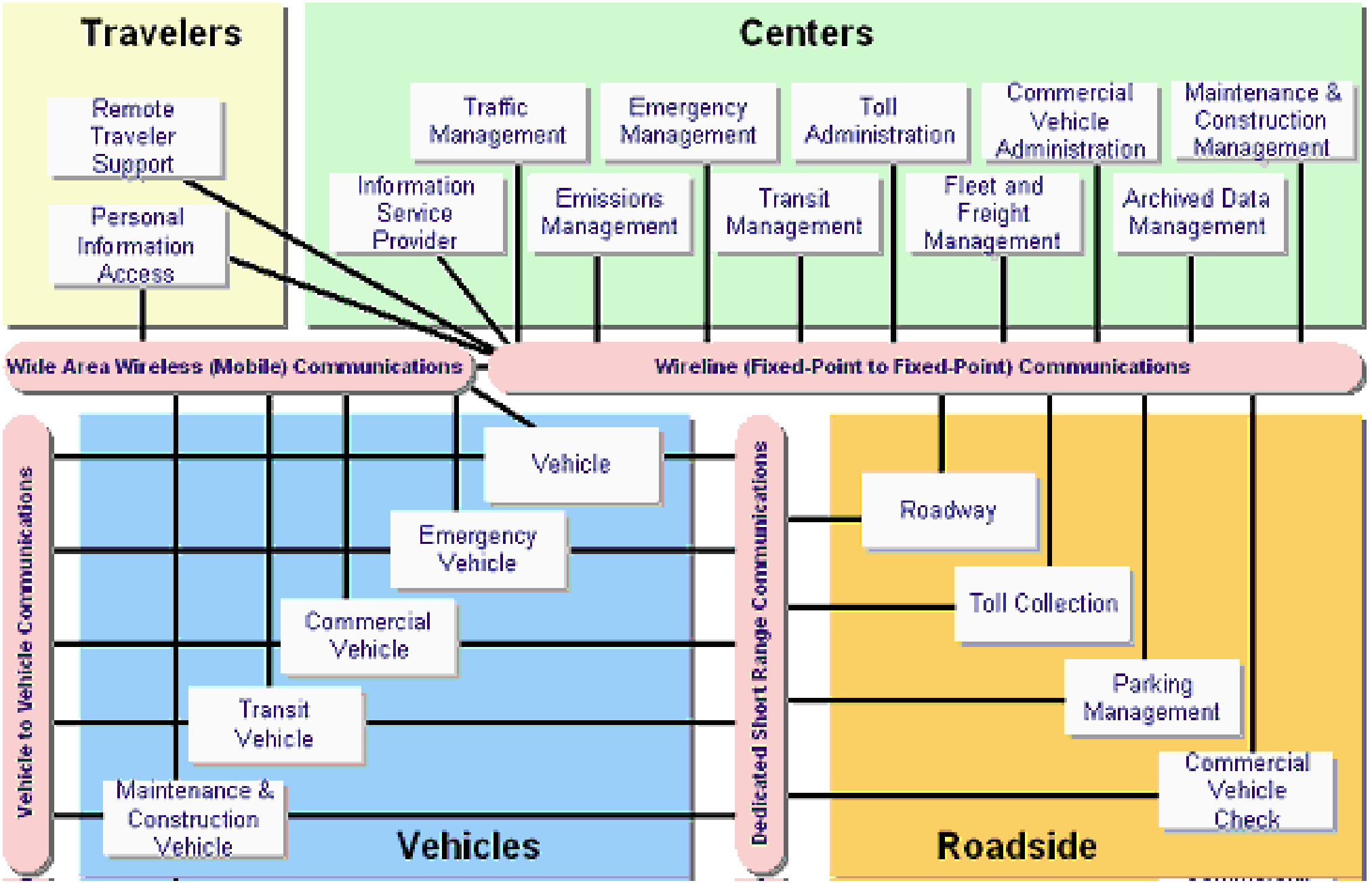
July 9, 2002

APPENDIX A

National ITS Architecture Diagram


Travelers
Centers
Remote Traveler Support
Personal Information Access
Traffic Management
Emergency Management
Toll Administration
Commercial Vehicle Administration
Maintenance & Construction Management
Information Service Provider
Emissions Management
Transit Management
Fleet and Freight Management
Archived Data Management
Wide Area Wireless (Mobile) Communications
Wireline (Fixed-Point to Fixed-Point) Communications
Vehicle to Vehicle Communications
Vehicle
Emergency Vehicle
Commercial Vehicle
Transit Vehicle
Maintenance & Construction Vehicle
Vehicles
Dedicated Short Range Communications
Roadway
Toll Collection
Parking Management
Commercial Vehicle Check
Roadside

APPENDIX B

ASTM DSRC Standards Writing Group Roster

ASTM 5.9 GHz DSRC STANDARDS WRITING GROUP PARTICIPATION

- 3-M
- AASHTO
- ACUNIA
- AMTECH
- ARINC
- ARMSTRONG COUNSULTING
- ATHEROS
- CALTRANS
- DIAMLER-CHRYSLER
- DENSO
- GM
- GTRI
- HIGHWAY ELECTRONICS
- HITACHI
- IDMICRO
- IMEC
- INTERSIL
- ITS-A
- JHU/APL
- KING COUNTY METRO TRANSIT
- MARK IV
- MiCOM Spa
- MICHIGAN STATE DOT
- MITRETEK
- MOTOROLA
- NISSAN
- N.Y. THRUWAY AUTHORITY
- OKI ELECTRIC
- PATH
- RAYTHEON
- SIRIT
- SUMITOMO ELECTRIC
- TECHNOCOM
- TOSHIBA
- TRANSCORE
- VISTEON
- WASHINGTON STATE DOT
- Wi-LAN

APPENDIX C

Proposed Rules – Amendments and Additions:

47 C.F.R. Part 90: Private Land Mobile Radio Services

Subpart A – General Information

- **Revise Section 90.7 Definitions**

  Amend definition of *Dedicated Short Range Communications Services (DSRCS)* substituting "private environments" for "commercial environments", deleting "non-voice", and adding a reference to new Section 90.391 (Permissible Communications) to read as follows:

  The use of radio techniques to transfer data over short distances between roadside and mobile radio units, between mobile units, and between portable and mobile units to perform operations related to the improvement of traffic flow, traffic safety and other intelligent transportation applications in a variety of public and private environments, and transmitting only those communications as permitted in Section 90.391. DSRC systems may also transmit status and instructional messages related to the units involved.

Subpart H – Policies Governing the Assignment of Frequencies

- **Add new subsection (j) to Section 90.175**: *For frequencies in the 5850-5925 MHz band:*

  (j)(1) Frequencies used to provide Public Safety Services may be coordinated by any frequency coordinator certified in the Public Safety Pool.

  (2) Frequencies used to provide Private Services may be coordinated by any frequency coordinator certified in the Industrial/Business Pool.

- **Change title of Section 90.176 to**: Coordinator notification requirements on frequencies below 512 MHz or at 764-776/794-806 MHz, or at 5850-5925 MHz.

- **Add new subsection (d) to 90.176 and renumber current subsections (d), (e), (f), (g), and (h) as new subsections (e), (f), (g), (h) and (i) with corresponding changes to internal references within current Section 90.176:**

  (d) *Frequencies at 5850-5925 MHz.* Within one business day of making a frequency recommendation, each frequency coordinator must notify and provide the information provided below to all other certified frequency coordinators in the Public Safety Pool and Industrial/Business Pool.

At a minimum the following information must be included in each notification:

(1) Name of applicant;
(2) Frequency or frequencies recommended;
(3) Location of fixed Roadside Unit(s) and corresponding antenna location(s) and height(s);
(4) Transmitter power (measured in effective radiated power (ERP)) range (measured in meters);
(5) Type(s) of emissions;
(6) Description of the communications zone(s) associated with each fixed Roadside Unit, including device class and installation class designations pursuant to Section 90.384;
(7) Date and time of recommendation; and
(8) antenna pattern.

- **Revise Section 90.207: Types of Emissions.**

  Renumber subsection (n) as (o) and add new subsection (n) as follows:

  (n) For DSRC services in the 5850-5925 MHz band authorized under this part, only F1D, G1D and W1D emissions will be authorized. Authorization to use digital voice emissions is construed to include the use of F1D subject to the provisions of Section 90.391.

Subpart M – Intelligent Transportation Systems Radio Service

- **Add new subheading before Section 90.371**: *Regulations Governing Licensing and Use of Frequencies in the 5850-5950 MHz for Dedicated Short Range Communications Services*

- **Revise Section 90.371: Dedicated short range communications service**

  Substitute "private environments" for "commercial environments", delete the word "non-voice", and adding a reference to new Section 90.391 (Permissible Communications) to read as follows in a revised subsection (a) as new item (1):

  (a)(1) These provisions pertain to the systems in the dedicated short range communications services (DSRCS). DSRCS systems utilize radio techniques to transfer data over short distances between roadside and mobile radio units, between mobile units, and between portable and mobile units to perform operations related to the improvement of traffic flow, traffic safety and other intelligent transportation applications in a variety of public and private environments, and transmitting only those communications as permitted in Section 90.391. When authorized, DSRCS licensees operating systems in the 5850-5925 MHz band may serve individuals, federal government agencies and

entities eligible for licensing in this Part, and must comply with the following requirements.

- **Add new subsections (a)(2), (3), (4), (5) and (6) to Section 90.371**:

(a)(2) Roadside Unit – The term *Roadside Unit* refers to a DSRC transceiver that is fixed alongside a road, highway, railbed or mounted on a vehicle for operation in a fixed location.

(3) On-Board Unit – The term *On-Board Unit* refers to a DSRC transceiver that is mounted in or on a vehicle, in some instances may be a portable unit capable of being carried by hand.

(4) Public Safety Services – The term *Public Safety Services* refers to radio services, including private internal radio services, used by State and local governments and non-government entities and including emergency road services provided by not-for-profit organizations, that (A) are used to protect the safety and mitigate the loss of life, health, or property; and (B) are not made commercially available to the public.

(5) Private Services – The term *Private Services* refers to a radio service used for data transmission between a licensee's fixed Roadside Unit located on premises controlled by the licensee and associated mobile On-Board Units or non-associated mobile On-Board Units licensed by rule pursuant to this subpart, and is not offered as a telecommunications service or otherwise operated as a direct source of revenue but is used to support the licensee's business operations or to protect the safety of their employees, customers, or the general public.

(6) Communications Zone – The term *Communications Zone* refers to the transmission contour corresponding to individual fixed Roadside Units as described in a license application. The communications zone is determined based on the Roadside Unit installation class designation of maximum transmitter power and maximum transmitter range.

- No changes to current subsection (b), which reads:

(b) DSRCS stations operating in the band 5850-5925 MHz shall not receive protection from Government Radiolocation services in operation prior to the establishment of the DSRCS station. Operation of DSRCS stations within 75 kilometers of the locations listed in the table below must be coordinated through the National Telecommunications and Information Administration. [NB. Table of government military radar sites not reproduced.]

- **Add new subheading after Section 90.371**: *Application for Authorizations*

- **Add new Section 90.372: Eligibility.**

The following persons are eligible for licensing in the 5850-5925 MHz Band to provide DSRC services.

(a) Any person eligible to provide Public Safety Services for licensing under subpart B of this Part or as that term is defined at Section 90.371(a)(4).

(b) Any person qualified to provide Private Services as that term is defined in this subpart at Section 90.371(a)(5).

- **Add new Section 90.373: Forms to be used.**

  Applications for Roadside Unit radio facilities to provide either Public Safety Services or Private Services must be prepared on FCC Form 601 and must be filed in accordance with 90.127 and part 1, subpart F of this chapter.

- **Add new Section 90.374: Supplemental information to be furnished by applicants for facilities under this subpart.**

  All applicants seeking to provide either public safety services or private services must supply the following supplemental information on its application:

  (a) Give the specific site location, including latitude and longitude, of each fixed Roadside Unit(s) for which authorization is sought.

  (1) Public safety and private entities may apply for authorization to operate up to six (6) Roadside Units under a single license.

  (2) Public safety entities may apply for temporary authorizations of Roadside Units in accordance with Section 90.137 of this Part so as to provide extended area “ribbon” or “corridor” aggregate communications zones that follow highways, trunk roads or other such transportation systems infrastructure.

  (b) Identify the device class and installation class designations, as provided for in Section 90.384, for each fixed Roadside Unit(s) for which authorization is sought.

  (c) Specify the number of associated On-Board Units, if any, to be placed in operation upon grant of the authorization, the estimated number of such units that will be placed in operation within the term of the license, and the device class designation.

  (d) Antenna pattern(s) of communications zone(s) associated with Roadside Unit(s) sought to be authorized.

- **Add new Section 90.375: Special limitations on amendment of applications for assignment or transfer of authorizations for DSRC radio systems.**

(a) A license to operate one or more Roadside Units may not be assigned or transferred prior to the completion of construction of the facility. However, the Commission may give its consent to the assignment or transfer of control of such a license prior to the completion of construction where:

(1) The licensee is a Public Safety entity;

(2) The assignment or transfer does not involve a substantial change in ownership or control of the authorized radio facilities;

(3) The assignment or transfer is involuntary due to the licensee's insolvency, bankruptcy, incapacity, or death; or

(4) The assignee or transferee is subject to the construction requirements as set forth in Section 90.380.

- **Add new Section 90.376: License by rule for On-Board Units**

  Individual licenses are not required for On-Board Units not otherwise associated with licensed Roadside Units. Such On-Board Units are authorized by this rule provided the certification requirements in Section 90.382 have been met. Only On-Board Units meeting the device class designations in subsection 90.384(a) may be licensed by rule.

- **Add new subheading**: *Policies Governing the Processing of Applications and Assignment of Frequencies*

- **Add new Section 90.377: Frequencies Available and Channelization Plan.**

  (a) The following table indicates the channel designations of frequencies available for assignment to eligible applicants within the 5850-5925 MHz band. The assigned frequencies refer to the fixed Roadside Unit(s) of a licensee.

Table: 5850-5925 MHz Channel Designations

Channel No.	Frequency Range (MHz)
172	5855-5865
174	5865-5875
176	5875-5885
178	5885-5895
180	5895-5905
182	5905-5915
184	5915-5925

(b) Channel pairs 174/176 and 180/182 may be combined upon a showing to the applicable frequency coordinator to create two 20 MHz channels to be designated as Channel Nos. 175 and 181, respectively.

(c) Channel No. 178 is assigned as the "Control Channel" for the transmission of short messages, announcements and public safety warnings are to be transmitted to On-Board Units in a public safety communications zone(s).

(d) Channel Nos. 172, 174, 176, 180, 182 and 184, and Nos. 175 and 181, if applicable, are assigned as "Service Channels" for the transmission of longer messages associated with specific designated applications as follows:

(1) Channel No. 172 is designated for public safety and private licensee vehicle-to-vehicle communications.

(2) Channel No. 184 is designated for high-power, coordinated use by Public Safety licensees.

- **Add new Section 90.378: Policies Governing the Assignment of Frequencies**

(a) All applications, whether for public safety services or private services, must comply with the frequency assignment policies found in Section 90.171(b)– (d).

(b) All applications, whether for public safety services or private services, must comply with the frequency coordination requirements of Section 90.175(a) and (j) and Section 90.176. [NB. Proposed changes to Sections 90.175 and 90.176 provided, *supra.*]

(c) The Commission shall assign licenses and frequencies, if applicable, on a site-by-site basis in a priority according to the order in which license recommendations are received from certified frequency coordinators.

(d) The frequencies authorized for use for the operation DSRC services are available on a shared basis only and will not be assigned for the exclusive use of any entity.

- **Add new Section 90.379: License period and termination.**

Licenses authorized for both Public Safety and private entities shall be authorized for a term as provided for in Section 90.149(a).

- **Add new Section 90.380: Construction period.**

(a) Public Safety and private licensees shall place their licensed facilities in operation as provided for in Section 90.155(a).

(b) Public Safety entities may seek extended implementation authorization for construction of fixed and temporary Roadside Units within an extended implementation in accordance with Sections 90.155(b) and 90.629.

(c) A showing of compliance with this section does not require the operation of at least one associated mobile unit for each licensed Roadside Unit.

- **Add new subheading**: *Technical Regulations*

- **Add new Section 90.381:** *ASTM E2213-02 DSRC Standard.* Transmissions of data signals shall comply with the standard for such transmissions set forth in the American Society for Testing and Materials (ASTM) E2213-02, Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems, Specific Requirements – 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications (**INSERT DATE CORRESPONDING TO FINAL, APPROVED STANDARD**) (ASTM E2213-02 DSRC Standard). This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies may be inspected at the Federal Communications Commission, 445 12th Street, SW, Washington, DC 20554 or at the Office of the Federal Register, 800 N. Capitol Street, NW, Washington, DC. Copies of the ASTM E2213-02 DSRC Standard can be obtained from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. Copies may also be obtained from ASTM via the Internet at www.astm.org.

- **Add new Section 90.382: Equipment Certification**

  All transponders, transmitters and transreceivers, whether associated with Roadside Units or On-Board Units, utilized for operation for DSRC services shall be typed certified in accordance with Section 90.203(a) of this part and subpart J, part 2 of this chapter. Applicants shall demonstrate compliance with the ASTM E2213-02 DSRC Standard identified in Section 90.381 of this part as a prerequisite to equipment-type certification.

- **Add new Section 90.383: Transmitter Power Limits**

  (a) The peak transmit output power over the frequency band of operations shall not exceed 750 mW or 28.8 dBm with up to 16 dBi antenna gain.

  (b) If transmitting antennas of directional gain greater than 16 dBi are used, the peak transmit output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 16 dBi, *i.e.*, the device's maximum EIRP shall not exceed 30 W EIRP. However, the peak transmitter output power may be increased to account for any line losses due to long transmission cables between

the transmitter and the DSRC device's antenna, provided the EIRP does not exceed 30 W.

- **Add new Section 90.384: Device Class and Installation Class Designations**

(a) *Device Class Designation*. Each DSRC device, Roadside Unit and On-Board Unit, to be operate shall be identified by one of the following device class designations:

Table: Device Class Designations

Device Class	Maximum Device Output Power
A	0 dBm
B	10 dBm
C	20 dBm
D	28.8 dBm

(b) *Installation Class Designation.* Each licensed Roadside Unit shall be identified by one of the following installation class designations:

Table: Installation Class Designations

Class Designation	Max. Transmitter Power	Max. Transmission Range
Class 1	10 dbm EIRP	15 meters
Class 2	20 dBm EIRP	100 meters
Class 3	33 dBm EIRP	400 meters
Class 4	44.8 dBm EIRP	1000 meters

(c) Each licensed Roadside Unit shall be associated with a "communications zone" based on its device and installation class designations and other relevant factors, including, but not limited to the type of antenna (*i.e.*, directional or omnidirectional) , angle of antenna relative to the horizon or horizontal, adjacent physical structures and topography. Each application and license shall include a narrative and technical description of such communications zone(s) associated with each licensed Roadside Unit.

Add new Section 90.385: Antennas

(a) *Antenna Input Power Limits*. For licensed Roadside Units operating in the frequency channels as identified in Section 90.377 antenna input power shall be limited as follows:

(1) For licensed Public Safety and private Roadside Units operating in Channels 174, 175 and 176, antenna input power shall not exceed 28.8 dBm and 33 dBm EIRP;

(2) For licensed private Roadside Units operating in Channel 178, antenna input power shall not exceed 28.8 dBm and 33 dBm EIRP;

(3) For licensed Public Safety Roadside Units operating in Channel 178, antenna input power shall not exceed 28.8 dBm and 44.8 EIRP;

(4) For licensed Public Safety and private Roadside Units operating in Channels 180, 181 and 182, antenna input power shall not exceed 10 dBm and 23 dBm EIRP. Such Roadside Units shall use an antenna with a minimum 6 dBi gain;

(5) For licensed Public Safety Roadside Units operating in Channel 184, antenna input power shall not exceed 28.8 dBm and 40 dBm EIRP. For licensed private Roadside Units operating in Channel 184, antenna input power shall not exceed 28.8 dBm and 33 dBm EIRP;

(6) For private On-Board Units operating in Channels 172, 174, 175, 176, 178 and 184, the antenna input power shall not exceed 28.8 dBm and 33 dBm EIRP. For Public Safety and private On-Board Units operating in Channels 180, 181 and 182, antenna input power shall not exceed 20 dBm and 23 dBm EIRP;

(7) For Public Safety On-Board Units operating in Channels 172, 174, 175, 176, and 184, the antenna input power shall not exceed 28.8 dBm and 33 dBm EIRP; and

(8) For Public Safety On-Board Units operating in Channel 178, the antenna input power shall not exceed 28.8 and 44.8 dBm EIRP.

(b) *Antenna Height Limits*. As measured from the roadway bed surface, antenna height shall not exceed 15 meters. Antennas at heights between 6 meters and 15 meters shall be deployed in accordance with subsection (c).

(c) *Antenna Height Gain Correction Factor*. To limit potential interference caused by antennas transmitting from Roadside Units at heights greater than six (6) meters above the roadway be surface, licensees must:

(1) reduce the authorized ERP by a factor of 20 log (Ht/6) in dB where Ht is the height of the radiation center of the antenna in meters above the roadway bed surface where the antenna height is between six (6) and 15 meters (or 6m<Ht<15m). ERP is measured as the maximum ERP toward the horizon or horizontal, whichever is greater, of the gain associated with the main or center of the transmission beam; and

(2) the maximum authorized effective EIRP is 33 dBm for any Roadside Unit installation where the antenna height is six (6) meters or greater above the roadway bed surface.

(d) A waiver of this antenna height correction factor, and the resulting height-gain power reduction, may be requested for an antenna height greater than six (6) meters above the roadway bed surface and must be accompanied by an engineering study justifying such a waiver. Waivers can be recommended at the discretion of a frequency coordinator upon a determination that the proposed Roadside Unit installation will follow reasonable and generally accepted engineering practices and that potential co-channel interference is properly minimized.

- **Add new Section 90.386: Emissions Limits**

  All transmissions shall comply with the emissions mask requirements of Section 90.210(k)(3) of this Part.

- **Add new Section 90.387: Frequency Stability**

  (a) Transmitters used for DSRC services must have a minimum frequency stability as specified in Section 90.213(a) of this part. [NB. Requires that frequency stability be specified in the station authorization.]

  (b) Frequency stability to be measured in accordance with Section 2.1055 of this chapter.

- **Add new Section 90.388: Radiofrequency Guidelines**

  All DSRC operations must comply with the RF safety guidelines as set forth in the Commission's ET Docket No. 93-62, *Second Memorandum Opinion and Order and Notice of Proposed Rulemaking*, ET docket No. 93-62, 12 FCC Rcd 13494 (1997).

- **Add new Section 90.389: Interference Contour**

  All frequency coordinators shall determine the applicable interference contour for all applicants based on a received power level of –88 dBm measured where the height of the antenna feed of the On-Board Unit is at 1.2 meters above the roadway bed surface with a 0 dBi antenna in the applicable channel.

- **Add new subheading**: *Operating Requirements*

- **Add new Section 90.390 General operating requirements.**

  All licensees operating in the 5850-5925 MHz band shall comply with the General Operating Requirements of this part as set forth in sections:

  (1) 90.403 General Operating Requirements;
  (2) 90.407 Emergency Communications;

(3) 90.411 Civil Defense Communications;
(4) 90.415 Prohibited Uses;
(5) 90.417 Interstation Communications;
(6) 90.425 Station Identification;
(7) 90.427 Precautions Against Unauthorized Operation;
(8) 90.429 Control Point and Dispatch Point Requirements;
(9) 90.431 Unattended Operation;
(10) 90.433 Operator requirements;
(11) 90.437 Posting station licenses;
(12) 90.439 Inspection of Stations;
(13) 90.441 Inspection and Maintenance of Antenna Structure Marking and Associated Control Equipment;
(14) 90.443 Content of Station Records;
(15) 90.445 Form of Station Records; and
(16) 90.447 Retention of Records.

- **Add new Section 90.391: Permissible communications.**

(a) Stations licensed for operation in the 5850-5925 MHz band may transmit only the following types of communications:

(1) Any data communication directly related to the imminent safety-of-life or protection of property;

(2) Data communications that satisfy the definition of Dedicated Short Range Communications Services in Sections 90.7 and 90.371(a)(1);

(3) Data communications directly related and necessary to those activities that make the licensee eligible for the Roadside Unit license held under this subpart;

(4) Data communications for testing purposes required for proper licensed Roadside Unit and system maintenance. However, each licensee shall keep such tests to a minimum and shall employ every measure to avoid harmful interference; and

(5) Data communications between On-Board Units and data communications between licensed Roadside Units and On-Board Units licensed by rule, regardless if such On-Board Units are associated with such licensed Roadside Unit.

(b) Stations licensed for operation in the 5850-5925 MHz band are prohibited from transmitting the following types of communications:

(1) Data communications between Roadside Units of differing licensees; and

(2) Two-way, real-time communications employing modulated voice techniques.

- **Add new Section 90.392: Operations of Roadside Units and On-Board Units**

(a) *Roadside Units*. Roadside Units may be fixed alongside a road, highway, rail bed or pedestrian passageway. Roadside Units may also be mounted on a vehicle or hand carried, but may only operate when the vehicle or hand-carried unit is stopped. Each Roadside Unit is restricted to operating under this subpart in a site-specific location and communications zone in accordance with its license. However, a portable or handheld Roadside Unit is permitted to operate where it does not interfere with another fixed Roadside Unit associated with a different licensee. A Roadside Unit transmits data to On-Board Units or exchanges data with On-Board Units within its communications zone. A Roadside Unit also provides channel assignments and operating instructions to On-Board Units in its communications zone, as necessary.

(b) *On-Board Units*. On-Board Units may be mounted in or on a vehicle (a mobile On-Board Unit), and in some instances may be a portable unit (operated in compliance with subsection (c)) capable of being carried by hand. They may be operational while a vehicle or person is mobile or stationary. An On-Board Unit receives and contends for time to transmit on one or more channels. Except where specifically excluded, an On-Board Unit is permitted wherever vehicle operation or human passage is permitted. All On-Board Units, whether mounted on a vehicle or handheld, are licensed by rule, and may only communicate with other On-Board Units or Roadside Units while operating in the 5850-5925 MHz band as provided for in this subpart. On-Board Units, whether mounted on a vehicle or handheld, may also operate in the Unlicensed National Information Infrastructure bands in accordance with subpart E of Part 15 of this chapter.

(c) *Portable On-Board Units*. Portable On-Board Units are On-Board Units that may operate while being carried by hand. All Portable On-Board Units shall comply with the following operational restrictions:

(1) May operate only on Channels 174, 176 and 178;

(2) May operate autonomously on Channels 174 and 176 where no Roadside Unit is present in those channels; may operate on Channels 174 and 176 under the direction of a Roadside Unit if present in those channels;

(3) May operate on Channel 178 only to send announcements, such as their presence on the channel to mobile On-Board Units and Roadside Units also operating on the channel;

(4) Any announcements made on Channel 178 may not consist of a transmission period greater than 200 microseconds in intervals of not less than 2 seconds; and

(5) Are class A DSRC devices.

- **Add new Section 90.393: Transmitter Control.**

  All transmitters operating from fixed Roadside Units shall comply with the transmitter control provisions found in this part as set forth in Sections 90.461 – 90.475.

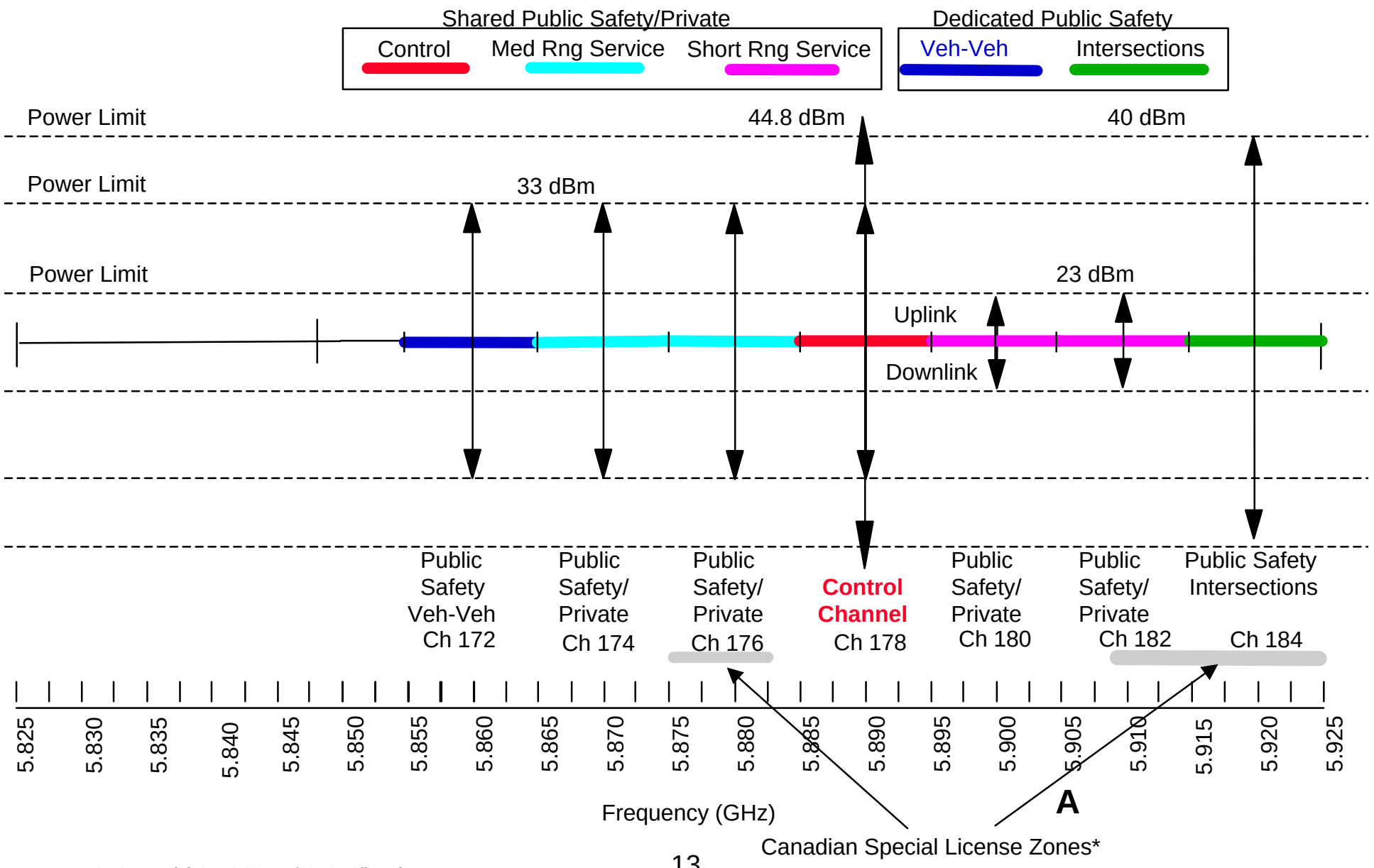
- **Add new Section 90.394: Listen-before-transmit techniques.**

  In accordance with the operating requirements of the ASTM E2213-02 DSRC Standard as set forth in Section 90.381, all DSRC systems operating in the 5850-5925 MHz Band must employ equipment that prevents transmission on a frequency channel if a signal from another system is present on that frequency channel. The level of monitoring must be sufficient to avoid causing harmful interference to other DSRC systems.

APPENDIX D

Charts: 10 MHz Channel and 20 MHz Channel Band Plans (including associated power limits)

5.9 GHz DSRC BAND PLAN with 10 MHz CHANNELS & POWER LIMITS



5.9 GHz DSRC BAND PLAN with 20 MHz CHANNELS & POWER LIMITS